JULY 20, 1944

American Machinist

TECHNOLOGY DEPT.
JUL 1 0 1944
DETROIT

Tool Engineers Refine Set-Ups For Fuze Components

•

Rebuilding Soviet Industries

•

Induction Hardening Advantageous In Fabricating Gun Parts

•

Machine Lubrication

Machining of Magnesium

30-DEG. RADIAL RAKE PROVES EFFECTIVE

PUT PRECISIONEERING IN YOUR PLANS

for

VITAL DAYS AHEAD

THE POSTWAR PRODUCT you are planning will have tough battles to fight . . . war-born ingenuity in other offerings, high wage scales, keen price competition both here at home and in world markets.

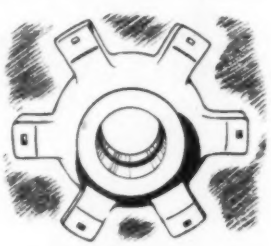
Nothing but the most modern, high rate production machine tools will do . . . *engineered* to make a better product, at lowest possible cost.

And that's where Heald Precisioneering will help. New product . . . or old . . . the *better way* is a challenge to Heald.

Heald engineers, more than 250 of them, devote all their time to precision machining problems. From a veritable encyclopedia of "know how", from the company's 40-year experience, they bring to a specific problem the direct answer . . . the correct Heald machine, and just the right tooling, to do the work with ultimate precision, speed and economy.

Discuss your requirements with Heald — a wealth of proved ideas, the precise workmanship of skilled hands, the value of a freshened outside viewpoint . . . are here placed at your disposal. If you cannot come, ask our nearest representative to call.

THE HEALD MACHINE CO.
WORCESTER 6, MASS.



PRECISION BORING OUTER TRUCK WHEEL

On a boring mill our customer machined only 6 per hour of these truck parts, —scrap was 25%. On the Heald No. 48A Bore-Matic, 20 per hour were obtained and after boring at least 5000 parts, not one has been rejected. More than 300% increased production—that *is* a pick-up!

HEALD *for precision plus . . . economy plus*

Internal and Surface Grinding Machines • Bore-Matic Precision Finishing Machines

TECHNOLOGY DEPT.

American Machinist

July 20, 1944

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Director of Circulation: Please change my address on American Machinist

From _____

_____

To _____

_____

Signed _____

American Machinist Chips

Machine Tool Ideas . . . We are getting a very interesting response to our suggestion that Metal-Working executives throughout the country might want to comment on and add to the points made in an article by Mr. H. T. Johnson of General Motors. The article appeared in our June 22 issue. In case you have forgotten, ten questions were posed on the efficiency of machine tool design and Mr. Johnson gave the composite opinions of the plant executives in various GM divisions.

Some very good ideas have been sent in. As we thank those gentlemen who answered, we'd like to urge others to give us the benefit of their experience. Results of this little survey will be published as soon as possible.

From The Mailbag . . . Every so often, in acknowledging renewed subscriptions to *American Machinist*, we ask readers how important and helpful to them are the advertising pages. We believe many of these comments will prove interesting to our whole group of readers, and from time to time we will quote excerpts so that you can compare your own experience with that of Metal-Working executives who write us. Here is the first:

"The writer has read the American Machinist *with a great deal of interest and profit for a great many years. In his capacity as Machinist, Chief Mechanic, Supervising Industrial Engineer, and as Works Manager, he has found the* American Machinist *of great value in keeping abreast of current mechanical advancement. This at best is a difficult job for busy executives.*

"The writer has found, in analyzing his own methods of reading periodicals of this type, that it is his practice to begin at the front cover and leaf through the entire copy to the back cover. In this way not only is the subject matter of the articles in the magazine given a superficial first glance, but every advertisement is likewise covered with its pertinent and condensed message. Covering both advertisements and subject matter in detail, the writer feels that he is kept fairly well abreast of all current advancement relative to Methods, Tools, Equipment, Materials and New Products. It may seem odd that the writer lays so much stress upon the reviewing of the advertisements in a magazine; but while the articles within the magazine are more completely informative and detailed, at a glance an experienced man can get the story from a well-prepared advertisement.

"It would seem that the moral of this is that copy for advertisements should be specific and should detail every single accomplishment possible with the product or tool, etc. This, of course, is not universally so, but this thought constitutes the advertisement that is the most helpful to the writer." Ralph S. Urner, Wks. Mgr., Union Hardware Company, Torrington, Conn.

Merry Christmas . . . George Trundle, of the Engineering Company of the same name, delivers a sharp warning to Metal-Working plants in a recent "Trundle Talks" booklet.

He poses the question "how much are Christmas trees worth the day after Christmas?" The answer is "just about as much as war production inventories (on hand in excess of allowances permitted under the Controlled Materials Plan) when war contracts are cancelled or terminated.

Mr. Trundle makes the point that when the war ends inventories of armament components will have very little, if any, market. He urges all manufacturers to go over their inventories now with a very keen eye to make sure that the wartime inventories are in line with C.M.P. allowances.

Pick Up . . . By the time this gets printed the following item might not be hot news but it's good news nevertheless.

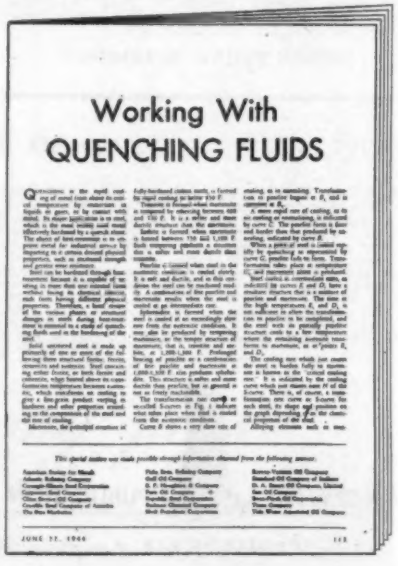
May shipments of machine tools amounted to approximately $41,000,000—or about the same as April. Even more significant, new orders for the month amounted to $61,000,000—a decided improvement on recent trends.

In talking to several machine tool builders we find that equipment for which demand has been stimulated includes not only special purpose machinery for new armament projects but many standard tools such as engine lathes.

Quenching Fluids . . . This is to remind you that our June 22 issue carried the latest *American Machinist* "Blue Section" on Working of Materials.

This one was titled "Working with Quenching Fluids" and gave a practical resume of the subject. Types, practice, precautions and equipment are discussed. Diagrams, charts and tables are included.

Reprints are now available at the usual 15c each, slightly less in quantities.


Working With
QUENCHING FLUIDS

USE SPIRAL BEVEL GEARS FOR QUIET, TROUBLE-FREE FAN DRIVES

In helping to produce food for the armies at home and at the battle-front, tractors are playing a role equal to the tank in winning the war.

Spiral bevel gears are important factors in dependable, heavy-duty tractor operation. These gears are used for tractor fan drives, because they assure long, trouble-free service life and quiet, smooth and positive operation at the high speeds required.

This application is typical of the highly successful use of spiral bevel gears for all types of fan drives, including air conditioning units and water coolers.

Send in prints to the Gleason Works of the fan drive units in your post-war designs. We will be glad to show you how spiral bevel gears will improve their operation, and prescribe machines for manufacturing the gears.

GLEASON WORKS

Builders of Bevel Gear Machinery for Over Seventy-five Years

1000 UNIVERSITY AVENUE, ROCHESTER 3, N. Y., U. S. A.

Milling a Radius the Tracer Controlled Way

SOLVES INTERFERENCE PROBLEM

CINCINNATI

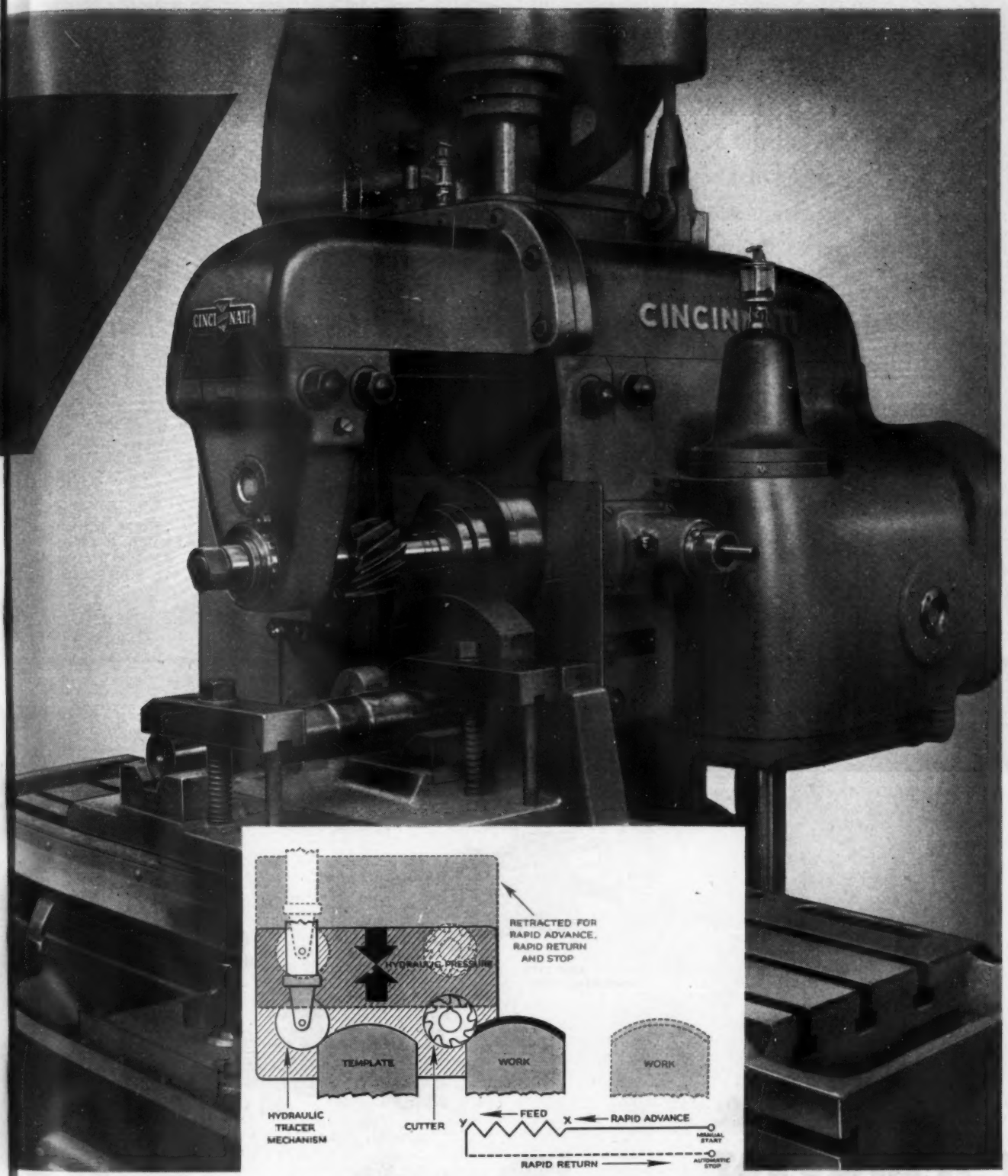
CINCINNATI *Plain Tracer Controlled Hydromatic. Catalog M-1295 gives complete specifications. Write for your copy today! For a brief description of all* CINCINNATI *Milling Machines, look in Sweet's Catalog File.*

It's possible to machine the radius on the counterweight end of these crankshafts in other ways, but milling them on a CINCINNATI Tracer Controlled Hydromatic is the most practical. Then the extension on the crankshaft, which is a hindrance in some methods, becomes an advantage, and "cutting air" is minimized. ¶ A single station work fixture consists of two Vee blocks in which the crankshaft rests and a locating bracket against which the side cheeks of the counterweight are located and clamped. The automatic operating cycle consists of a rapid advance of table and dropping spindle carrier to the cam, profiling around the radius at a rate of 2″ a minute, raising the spindle carrier and rapid return of table to loading position. ¶ Perhaps you have a production part that could be handled to better advantage on a Tracer Controlled Hydromatic. The application engineers here at Milling Headquarters will be glad to discuss this with you.

Keep on buying WAR BONDS

THE CINCINNATI M

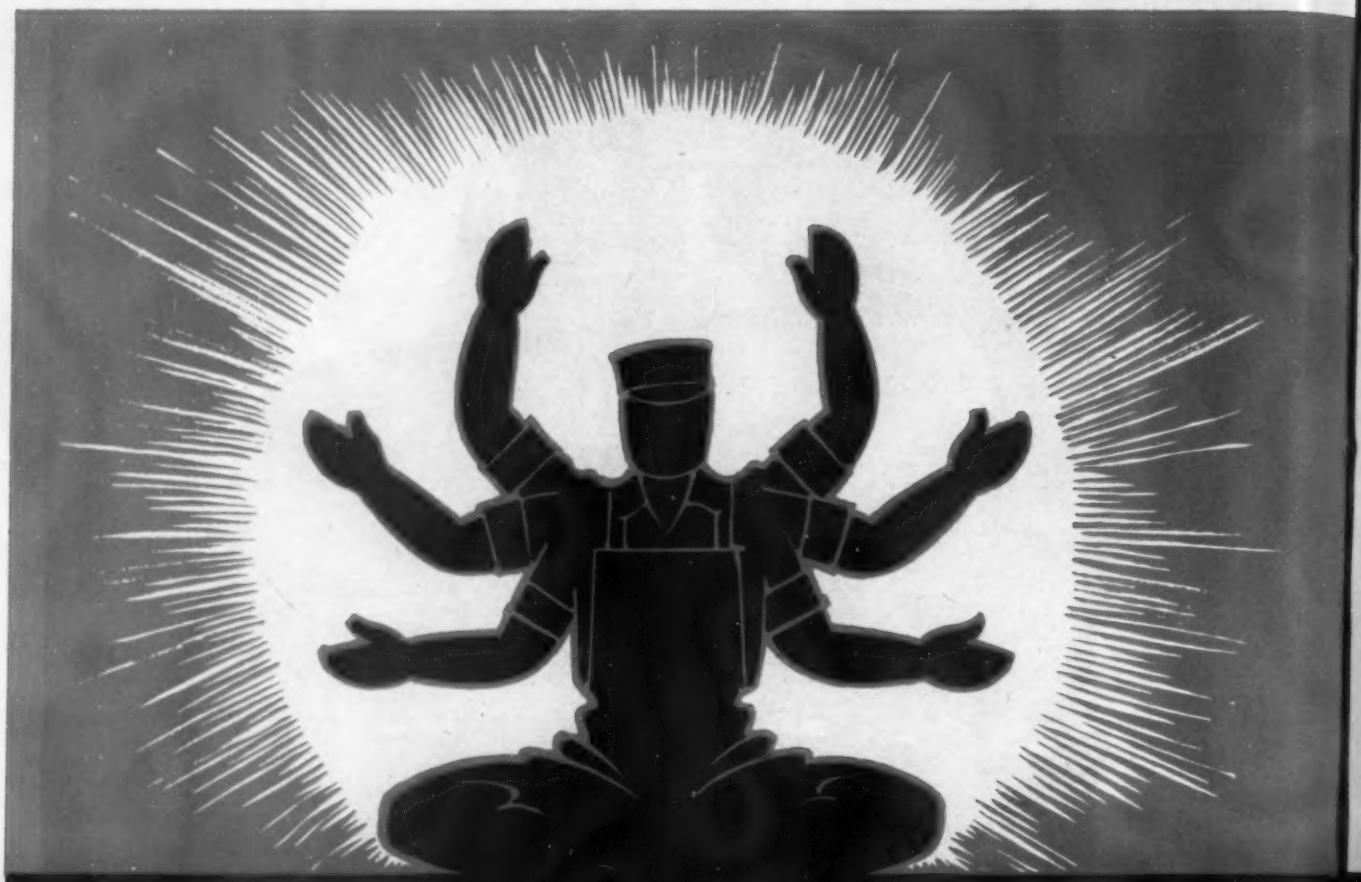
MILLING MACHINES



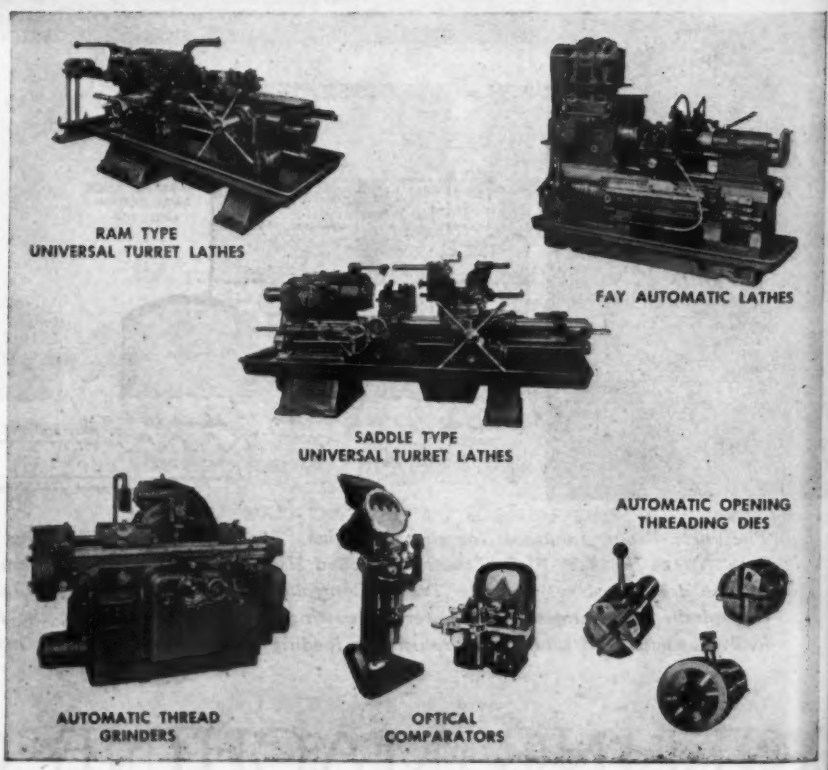
The part: Front crankshaft for aircraft engine. The operation: Mill radius on counterweight. The machine: CINCINNATI *No. 4-36 Plain Tracer Controlled Hydromatic with single station fixture mounted on machine table.* ¶ *The drawing shows how the Tracer Controlled Hydromatic Miller works. At point X, the table stops and the spindle head automatically lowers to cutting position. At point Y, the table stops, spindle head automatically retracts, and table rapid returns to loading position. The operator merely loads and unloads the fixture.*

MILLING MACHINE CO. CINCINNATI 9, OHIO, U. S. A.

BROACHING MACHINES • CUTTER SHARPENING MACHINES



How many hands does a turret lathe operator need?



JONES & LAMSON

MACHINE COMPANY

SPRINGFIELD, VERMONT, U. S. A.

Manufacturers of: Universal Turret Lathes • Fay Automatic Lathes • Automatic Double-End Milling and Centering Machines • Automatic Thread Grinders • Optical Comparators • Automatic Opening Threading Dies and Chasers.

Many a turret lathe operator must have wished, at times, that he were like the six-armed deity of the Hindus, for faster-cutting tools have greatly increased the productivity of these machines and the burden upon the operator. The necessity for simplified controls to save waste motion and operator fatigue is, therefore, imperative!

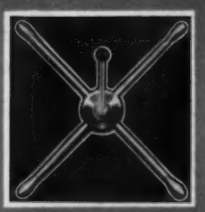
Jones & Lamson Universal Turret Lathes are designed not only to take full advantage of the fastest-cutting tools, but also to give every mechanical aid to the operator so that he can operate to the maximum capacity of the machine without undue fatigue.

We show here some of the man-saving, time-saving features built into these machines. Write to us for more detailed information and descriptive literature.

—— only two — if it's a Jones & Lamson

SINGLE LEVER SPINDLE SPEED SELECTOR

With direct reading dial, to control all spindle speeds. Next speed pre-selected while cut is in progress.



POWER TRAVERSE AND INDEXING OF THE HEXAGON TURRET

Turret of saddle type machines is power traversed and power indexed. A time saver and man saver too.

SINGLE LEVER FEED SELECTORS

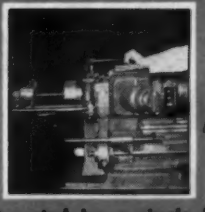
Controlled by single lever, direct reading, selectors. Feeds pre-selected while cut is in progress.

AUTOMATIC LUBRICATION SYSTEM

Requires minimum of attention. Flow of lubricant automatically increases as spindle speed increases.

AUTOMATIC COOLANT SUPPLY TO HEXAGON TURRET

A copious supply of coolant is pumped automatically to the working face of the hexagon turret.



SIMPLIFIED BAR FEED AND COLLET OPERATING MECHANISM

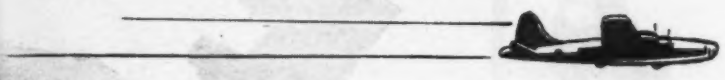
Operated by a single lever, which opens chuck, feeds in stock and closes chuck.

All these features and many others are incorporated as standard in Jones & Lamson Universal Turret Lathes.

Fellows Involute Measuring Machines both in 12 and 24 inch sizes have manifest advantages from the standpoint of design and operation. A master involute cam is employed, thus dispensing with so-called "base rolls" "sine bars" and calculations.

THE FELLOWS METHOD...MACHINES AND TOOLS FOR

HORSEPOWER ON A SINGLE GEAR LIKE THIS



Gear tooth loading is now carried beyond man's imagination of a few years ago. This is a triumph of metallurgy, engineering, and precision-controlled manufacturing methods, and also a tribute to the cumulative development in machine tools and inspection equipment.

Fellows' reservoir of nearly 50 years of gear production knowledge has in no small measure contributed to this outstanding development, both in the production of cutting and finishing machines, and in the means for accurately checking the finished product.

Fellows Involute Measuring Machines in the 12 and 24-inch sizes have made possible the checking of gear tooth profiles to degrees of precision that heretofore have not been possible. These machines are also available with an electronic-operated charting mechanism which produces an accurate record of the profile for comparison and record. Above all, these machines are simple in construction and are easy to operate.

For details of the Fellows Involute Measuring Machines write for descriptive bulletin. The Fellows Gear Shaper Company, Springfield, Vermont—or 616 Fisher Bldg., Detroit 2, or 640 West Town Office Bldg., Chicago 12.

Fellows

ALL OPERATIONS FROM BLANK TO FINISHED GEAR

PLAIN HYDRAULIC GRINDER

HANDLES DIFFICULT

Here a modified CINCINNATI *10" Plain Hydraulic Grinder is rough grinding crankcase side and finish grinding diameter of flange of cylinder barrel.*

Keep on buying WAR BONDS

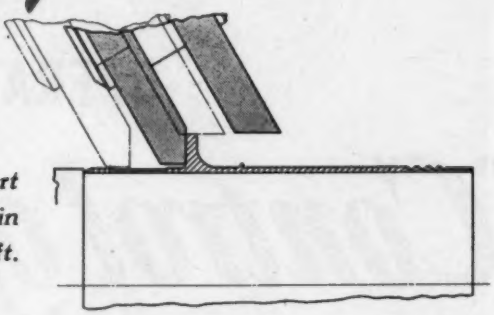
CINCINNATI G

CIN

CENTER TYPE GRINDING MACHINES CEN

with special equipment

PRODUCTION JOB



Right: Sketch of the part which is being ground in the illustration at the left.

This is another example of how a modified basic machine handles a difficult grinding operation. For this job a CINCINNATI 10" Plain Hydraulic Grinder was equipped with: 1) Heavy duty live spindle headstock. 2) Angular wheel head. 3) Air operated fixture. 4) Special table type wheel truing attachment. 5) Two-wheel mount. 6) Increased wheel head retraction. Equipment also included standard Servo infeed attachment. You will notice this is a two-wheel job. The heavy duty headstock assures sufficient rigidity to eliminate the need for a footstock and to permit grinding within close limits of accuracy. ¶ Here again CINCINNATI application engineers have proved that highly specialized jobs don't always require the building of special machines. Talk over your grinding problems with the engineers here at Grinding Headquarters. They may be able to work out a better way of handling some perplexing grinding operation.

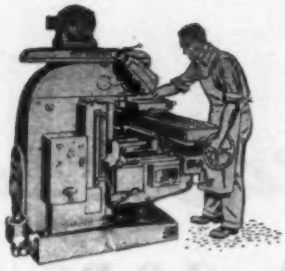
At the left is an illustration of a CINCINNATI 10" Plain Hydraulic Grinding Machine. Catalog G-490-1 gives complete specifications of standard machine. For a brief description of all CINCINNATI Grinding Machines, look in Sweet's Catalog File for Mechanical Industries.

CINCINNATI

GRINDERS INCORPORATED

CINCINNATI 9, OHIO, U. S. A.

CENTERLESS GRINDING MACHINES • CENTERLESS LAPPING MACHINES



OPERATORS ALWAYS HAVE

"Control of the Situation"

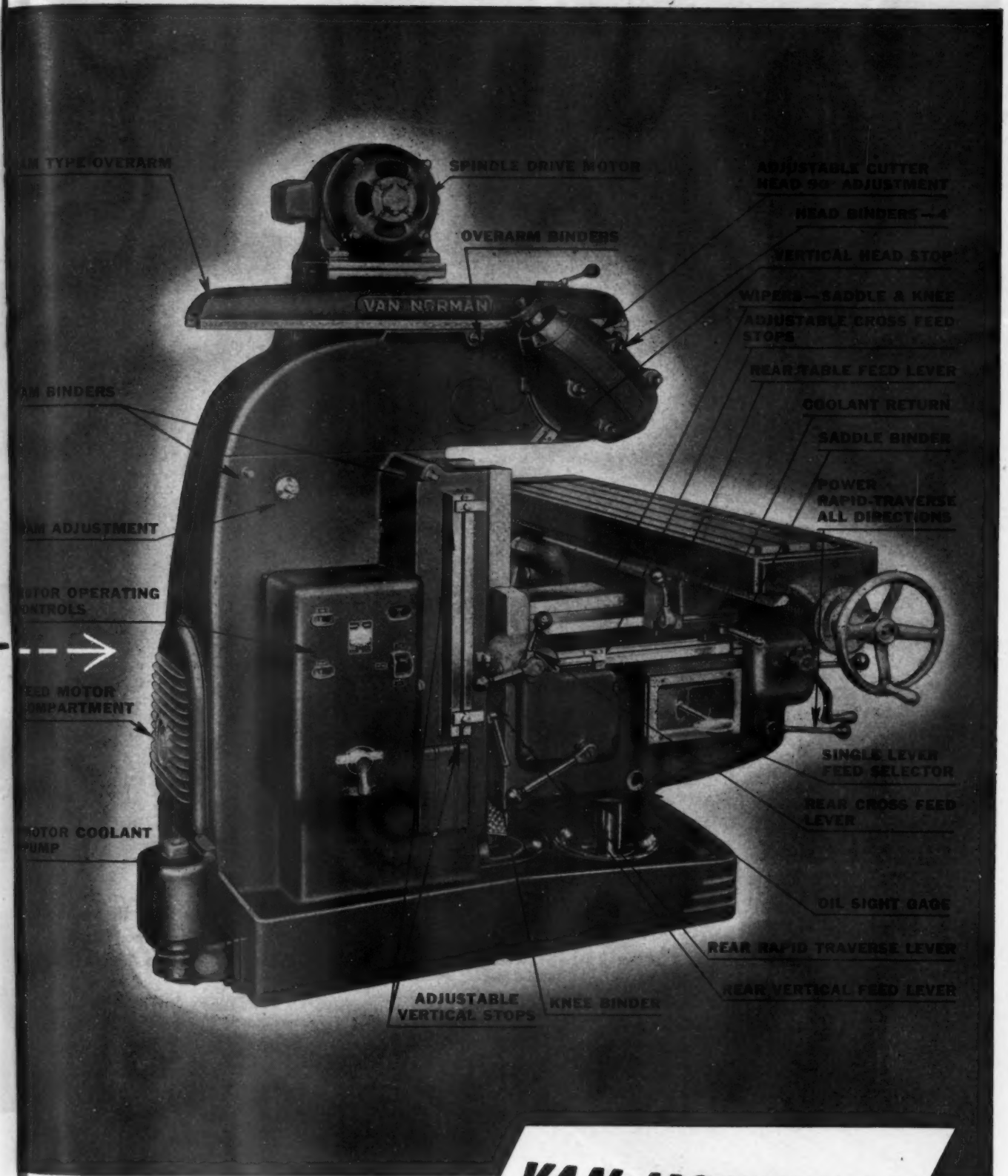
...ON VAN NORMAN RAM-TYPE MILLERS

All controls and adjustments are right at hand . . . quick and easy to use . . . on Van Norman Ram-Type Millers. So operators can turn out better work and more of it, in less time. Operators also find their work lightened and speeded up by front-and-rear controls of power feeds and 6-way rapid traverse . . . single-lever selectors of feeds and speeds . . . and large, glare-proofed dials that are easy to read.

Many jobs can be carried to completion . . . through successive vertical, angular and horizontal cuts on the same machine . . . simply by resetting the cutterhead, instead of taking the time (and the risk of errors) otherwise required to reset the work. In fact, every feature of Van Norman Ram-Type Millers is designed to combine highest accuracy with greatest ease of operation, on toolroom and production jobs.

SPECIFICATIONS:
No. 26 RAM-TYPE MILLER:
Table: 50" x 12"
Range: 28" longitudinal, 12" cross, 18" vertical
18 Speeds: 30 to 1500 rpm
18 Feeds: 3/16" to 32"

VAN NORMAN COMPANY SPRINGFIELD,



MASSACHUSETTS

VAN NORMAN Milling Machines

The LANDMACO

THE LANDIS CHASER

The finest thread cutting tool in industry.

Close-up of the threading operation of the Double Head Landmaco Threading Machine.

Write for Bulletin H-75

LANDIS

THREADING MACHINERY • THREAD CUTTING DIE HEADS CO

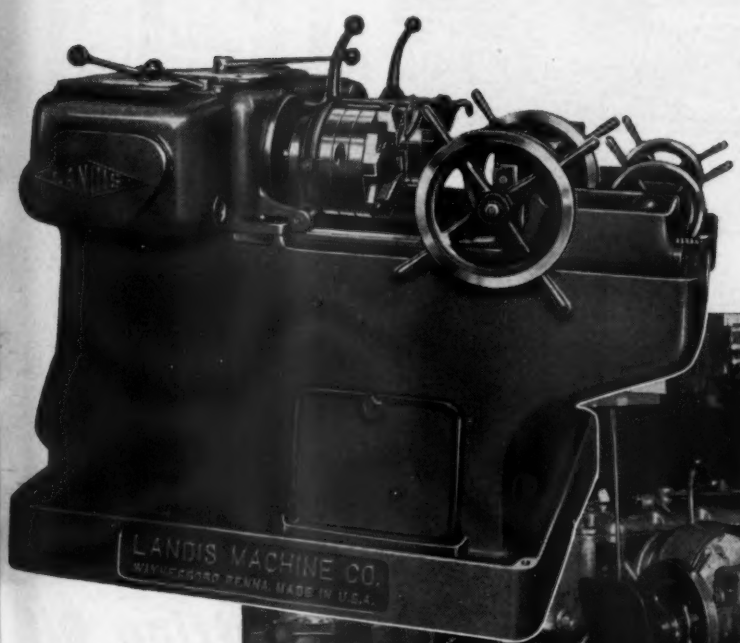
Threading Machine

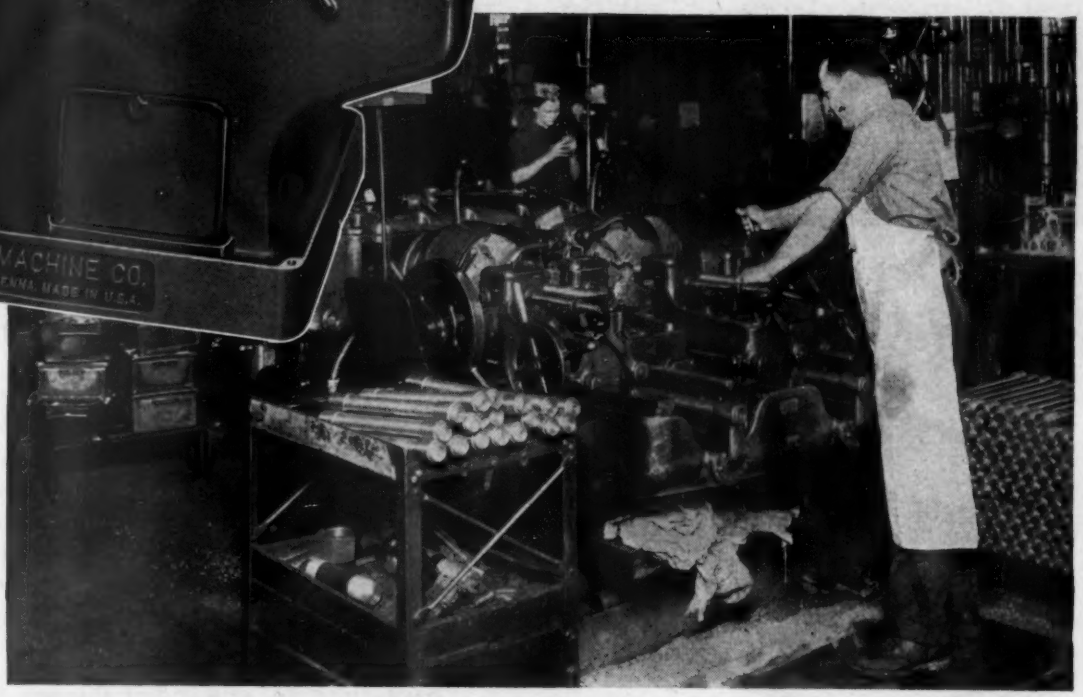
Assures the Fine Threading Accuracy Required for Diesel Engine Studs

Cylinder Head Studs of the Diesel Engine are made from heat-treated alloy steel and present a difficult threading operation. The threads must be held to extremely close tolerance specifications.

Manufacturers of these parts using Landmaco Threading Machines have no difficulty in meeting the specifications.

To the left is shown the Double Head Landmaco Threading Machine. Below, the same machine in operation, threading Diesel Engine Studs.





MACHINE CO. WAYNESBORO PENNA. U.S.A.

HEADS · COLLAPSIBLE TAPS · PIPE THREADING AND CUTTING MACHINES

Write your own specifications for the ideal heavy-duty broaching oil . . .

WON'T INJURE SKIN OF OPERATOR

PREVENTS WELDING OF CHIPS TO THE BROACH

BETTER FINISH . . . INCREASED PRODUCTION

REDUCES FRICTION BETWEEN TOOL AND CHIP

DISSIPATES HEAT RAPIDLY

LONGER BROACH LIFE

Photo courtesy American Broach and Machine Company

They add up to MARATHON 860-B Cutting Oil

HERE'S WHAT AN IMPORTANT BROACHING MACHINE MANUFACTURER SAYS ABOUT IT:

"... used Marathon 860-B Cutting Oil on jobs involving considerable metal removal from tough steel parts... the type of operation where excess heat is often involved. It was interesting to note that this cutting oil effectively dissipated heat and also thoroughly lubricated during the cutting stroke, allowing the chips to freely drop out of the broach teeth. A very good surface finish was also obtained.

"... have since recommended the use of 860-B Cutting Oil on certain broaching operations which customers of ours are doing." AMERICAN BROACH AND MACHINE COMPANY

A Complete Line of Cutting and Grinding Oils for Every Metal Working Operation

Write or wire for additional facts

The OHIO OIL COMPANY

General Offices: Findlay, Ohio. District Offices: Robinson, Ill., Indianapolis, Ind., Louisville, Ky.

MARATHON

PRODUCERS OF PETROLEUM SINCE 1887

TOMORROW'S JOBS can be handled on TODAY'S MACHINES through

P&J RE-TOOLING

from PRE-WAR FLY-WHEELS to POST WAR DEMANDS

Away back before Pearl Harbor, this 5 DE P&J POWERFLEX made possible the economical production of tractor flywheels in small lots. Floor to floor time was only 5.81 minutes with the set-up as shown.

One of the reasons for the low production cost was the convenient operation and quick adjustment which reduced changeover time to a minimum. P&J engineers were responsible for developing the special tooling required for this job.

P&J is now prepared to RE-TOOL this machine as well as all P&J machines which may be released for post war needs) and convert it for use in producing parts which come within the scope of its capacity. What these parts are may still be only in the design stage. But regardless of their state of development, you are invited to submit your ideas to P&J engineers for study. Let us advise you in advance just what the RE-TOOLING possibilities of your P&J machines will be as a means of producing those new parts at low cost on your present P&J Automatic Chucking Machines. It will pay you to plan for your post war production NOW.

POTTER & JOHNSTON MACHINE COMPANY

Pawtucket, R. I.

P & J Rebuilding Service

Owners of P&J equipment, interested in rebuilding their P&J Chucking Machines to restore original productivity and accuracy, are invited to investigate our RE-BUILDING SERVICE. Where desired, RE-TOOLING can also be handled while machines are in our shop for rebuilding.

Back our Boys with **BONDS** and...

MORE BONDS!

A New

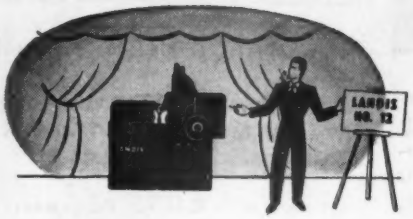
CENTERLESS GRINDER

of Advanced Modern Design

LANDIS TOOL

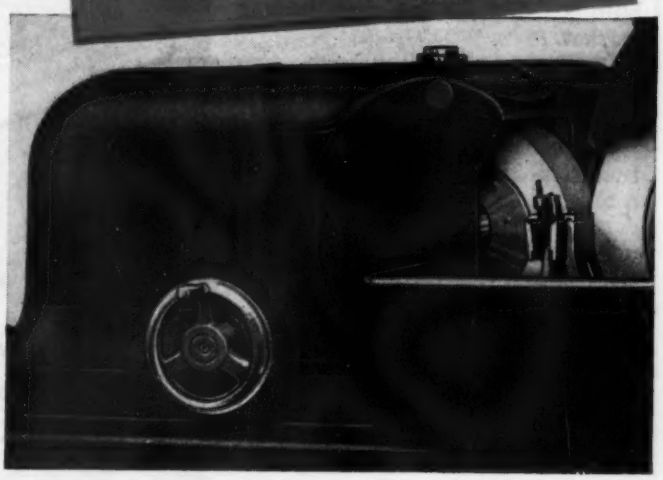
Precision Grinders

LANDIS TOOL COMPANY



Grinding wheel feed and main control grouping Electrical controls include master stop and start buttons, three-way selector switch for set-up, grinding and dressing. Separate adjustments provide regulating wheel speed adjustment and speeds for dressing both wheels.

Regulating wheel base is a complete self-contained unit with an adjustable speed motor driving the wheel. The wheel base can be tilted and swiveled and has a hydraulically operated cross slide.



● The new Landis #12 Centerless Grinder is as modern in features and design as it is in appearance. Outstanding among the many features are the simple centralized controls and the self-contained regulating wheel base.

Both electric and hydraulic controls are located at a convenient height, so grouped that all operations can be controlled quickly and without loss of production time. This contributes materially to the sustained high production possible with the new Landis #12.

The separately driven regulating wheel makes possible new standards of grinding accuracy because of the smooth flow of driving power over the full speed range of the wheel. The best speed for maximum production can be selected without interrupting the grinding cycle.

For complete information on the features of design and specifications of the Landis #12 Centerless Grinding Machine request a copy of Catalog T44. Write The Landis Tool Co., Waynesboro, Pa., on your letterhead giving name and position.

LANDIS TOOL Company

LANDIS TOOL

WAYNESBORO • PA.

The CONE AUTOMATIC MACHINE COMPANY

sees many

GOOD THINGS AHEAD

It is reported that . . . . . .

Vibrating chisels, similar to those used to break up pavements, are being tried out by dentists as an improvement over the familiar drill.

get ready with CONE for tomorrow

The rare metal, tantalum, unknown forty years ago, is being used in bolts, screws, and plates to repair the broken bones of wounded soldiers.

get ready with CONE for tomorrow

A gas-filled fuse, now used to detonate mines, will explode a charge three and one-half miles away in one second. It can be used under water and is itself a powerful explosive. Laid in a line cross-country, it will instantly clear a path through trees and brush or dig trenches.

get ready with CONE for tomorrow

A low priced ultraviolet lamp bulb is ready for the after-the-war market.

get ready with CONE for tomorrow

A noted aviation engineer and successful industrialist has plans for a revolutionary helicopter that uses a contra-rotating propeller, carries four passengers, and can be operated on a highway.

get ready with CONE for tomorrow

A new heat-resistant alloy is reported that uses silicon and manganese to replace part of the scarce nickel and chromium formerly used.

get ready with CONE for tomorrow

Fireproof cotton batting is now being made for upholstery and insulation.

get ready with CONE for tomorrow

A new iron is being made which has as much as five times the tensile strength of ordinary cast iron. With it, even cast iron springs can be made.

A plant has been built for processing large quantities of the lowly milkweed. The floss is a good substitute for kapok in upholstery, an oil for paint is made from the seeds, wallboard can be made from the stalks, and latex extracted from the leaves.

get ready with CONE for tomorrow

A new machine checks the size of ball bearings at rates as high as 20,000 per hour.

get ready with CONE for tomorrow

New sleeping cars have a triple deck arrangement of berths.

get ready with CONE for tomorrow

The "electric eye" can now be used to detect and warn of dangerous gases in the air.

First post-war models of television sight and sound receivers are expected to sell at from $200 to $700. Reception will about equal in quality the familiar 16 mm. motion pictures.

get ready with CONE for tomorrow

A new cream protects those of our Navy who are exposed to the risk of flash burns.

get ready with CONE for tomorrow

Coilsprings of Nylon, while not as strong as steel, will function indefinitely without breaking from "fatigue."

get ready with CONE for tomorrow

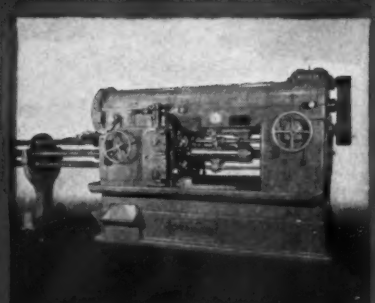
A new rubber sheeting perforated with 6,400 holes to the square inch is being used for filters.

get ready with CONE for tomorrow

A new microscope converts an invisible ultra-violet image into a visible full color picture without the use of photography or fluorescent screens.

You'll need production like this in the days AHEAD

THIS speedometer pinion blank is made of cold rolled steel and has a hole 1" deep in one end. It is produced in 10 seconds on a 6-Spindle Conomatic.



CONE

AUTOMATIC MACHINE CO., INC. ★ WINDSOR, VERMONT, U. S. A.

8

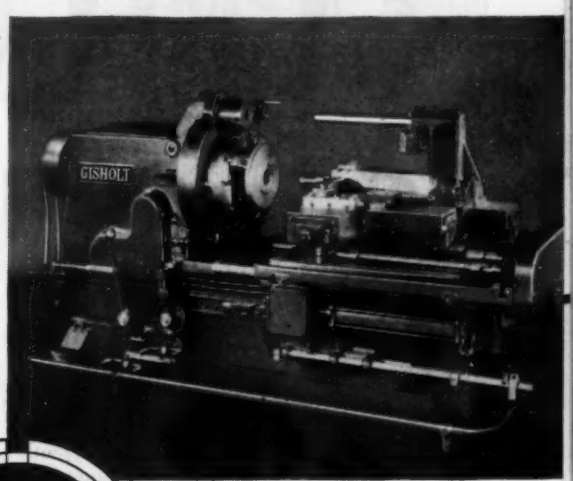
. . . BY THE GISHOLT SIMPLIMATIC

Production cost on one lot cut from $74 to $21.50!

"Thanks to Gisholt Simplimatics," said the manufacturer who reported this impressive saving. On switching to Simplimatic Lathes, he saw the output jump almost 50% . . . costs cut 71%! And the four Simplimatics required only *two* operators where the previous machines took *four!*

Results like this are to be expected where Simplimatics take over. For these rugged, multiple-cutting lathes are designed to provide the extremely high speed so vital to mass production. Since all operations are completely automatic, one operator can tend several machines.

There you have it—high speed, extreme accuracy, simple operation. If these things are important to you, investigate the Gisholt Simplimatic now. A postcard will bring full particulars.



GISHOLT MACHINE COMPANY
1201 East Washington Ave. • Madison 3, Wisconsin

Look Ahead . . . Keep Ahead . . . with Gisholt Improvements in Metal Turning

GISHOLT

GISHOLT SIMPLIMATICS are built in both Platen and Radial types. Both permit a wide variety of tool arrangements, yet neither requires a high degree of skill from the operator.

TURRET LATHES • AUTOMATIC LATHES • BALANCING MACHINES • SPECIAL MACHINES

CADILLAC Thread GAGES

WIRE YOUR ORDER Today!

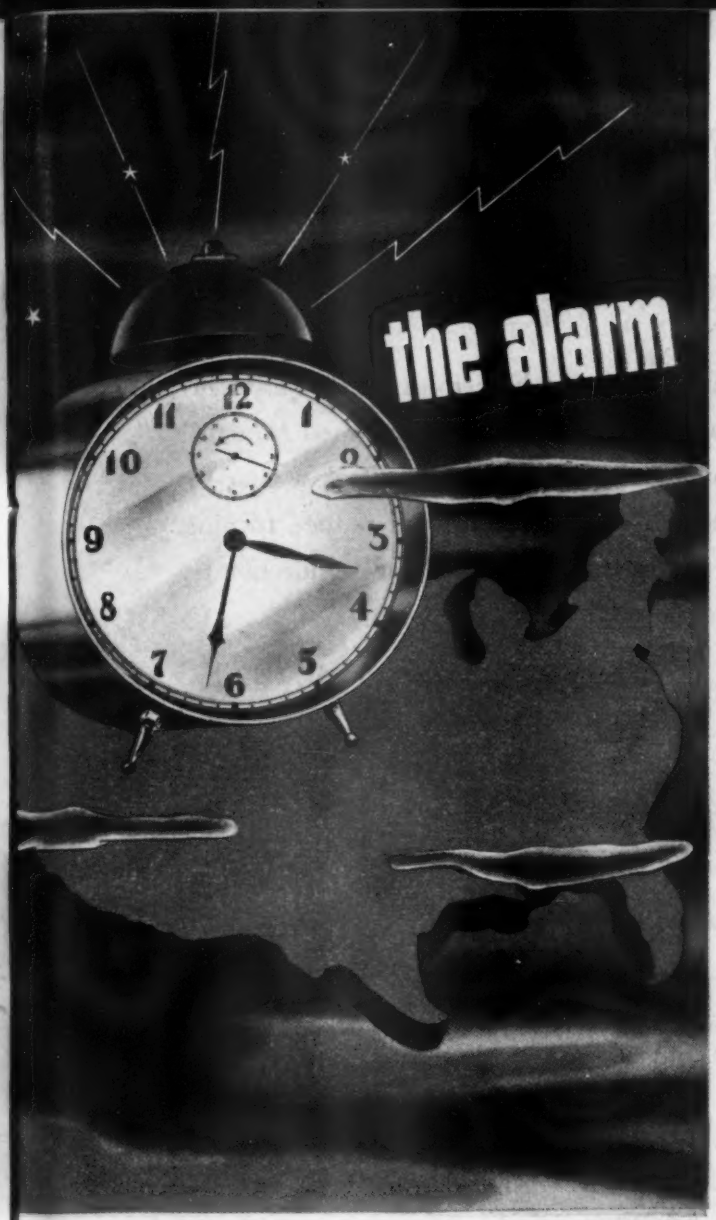
WHEN you need standard thread gages for important inspection work and can brook no delay, just say the word and you'll have them as soon as train or plane can get them to you.

As manufacturers of both Thread Plug and Thread Ring Gages exclusively, we carry an unusually complete stock. Consequently we are in a position to make immediate shipment except in case an abnormal demand has temporarily depleted our supply of certain particular sizes.

If you are unable to get the gages you need from your customary source of supply, send a wire to Cadillac. You'll be pleased not only by our promptness in delivery but also by the quality and accuracy of the gages that you receive.

CADILLAC THREAD GAGES CADILLAC

CADILLAC GAGE COMPANY, Detroit 5



rang months ago!

At 3:32 A. M. Eastern War Time, June 6, 1944, the official announcement of the invasion of "Fortress Europe" was released by General Dwight D. Eisenhower. It marked the opening of the second front—the greatest event of all time... the beginning of the end of the war. It sounded the alarm for management to wake up and definitely plan for peace.

To talk about postwar plans is not enough. Now is the time for actual, factual planning and doing if private enterprise is to survive. *The alarm rang months ago.*

Now is the time to plan your new installations of machine tools — to actually place your orders — to prepare for the day when you will have to supply more and more peacetime goods at lower cost.

LeBlond is making Tomorrow's Cost-Downing Lathes Today. A study of their exclusives and many other features will convince you that LeBlond's are the turning tools that belong in your "peace work" production program. Write today for your copy of LeBlond Lathe Bulletins. Use the coupon.

THE R.K. **Le BLOND** MACHINE TOOL CO., CINCINNATI, 8

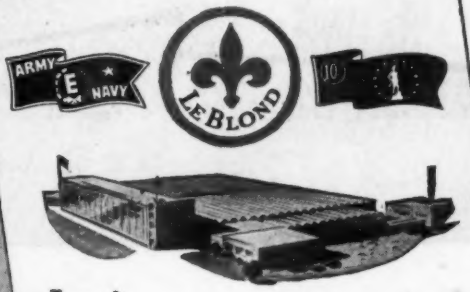
NEW YORK 13, 103 Lafayette St. CAnal 6-5281

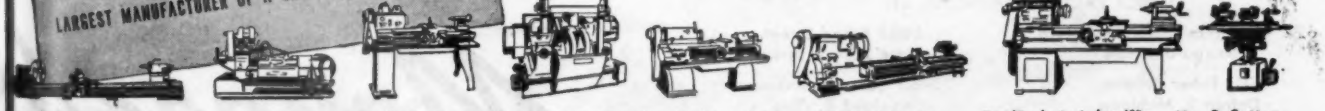
CHICAGO 6, 20 N. Wacker Dr. STA 5561

time to retool

Turn to Le Blond for Turning Equipment

LARGEST MANUFACTURER OF A COMPLETE LINE OF LATHES





HD Engine Lathes—Nine sizes ranging from 12" to 50" swings. For versatility in turning.

Automatic Lathes—12" & 16" Mechanical or Hydraulic power.

Super Regal Lathes—Six sizes, 13" to 24" Best for training.

Automatic Crankshaft Lathes—For all facing, turning, finishing, pins.

Tool Room Lathes—12", 14", 16" and 18" swings. Versatile.

HD Gap Lathes—Ten sizes in Regular and Sliding Gap models.

Rapid Production Lathes—13", 17", 20" swings. Six speeds. Faster output. Lower cost.

No. 2 Cutter Grinder—Internal, cylindrical, face and angular work.

Check-Clip-Mail

FOR ILLUSTRATED SPECIFICATIONS:

- ☐ HEAVY DUTY GEARED HEAD ENGINE LATHES
- ☐ TOOL ROOM LATHES
- ☐ AUTOMATIC LATHES
- ☐ HEAVY DUTY GEARED HEAD GAP LATHES
- ☐ SUPER REGAL GEARED HEAD LATHES
- ☐ RAPID PRODUCTION LATHES
- ☐ AUTOMATIC CRANKSHAFT LATHES
- ☐ No. 2 CUTTER GRINDER

YOUR NAME _____ TITLE _____

YOUR FIRM _____ ADDRESS _____

★ YOUR BONDS BUY BOMBS ★

BUY A "BLOCK-BUSTER" TODAY!

Cut turning time with

12" x 36" Monarch Lathe

16" x 30" Monarch Lathe
also made in size 19" x 30"

18" x 48" Monarch Lathe

20" x 48" Monarch Lathe
also made in size 23" x 48"

10" x 20" Monarch Sensitive
Precision Toolmaker's Lathe

12" x 30" Monarch
Toolmaker's Lathe

14" x 30" Monarch
Toolmaker's Lathe

16" x 30" Monarch
Toolmaker's Lathe

DIRECT FACTORY BRANCHES AT:

622 West Washington Boulevard,
Chicago 6, Illinois

1060 Broad Street,
Newark 2, New Jersey

801 Fisher Building,
Detroit 2, Michigan

10465 Carnegie Avenue,
Cleveland 6, Ohio

512 Empire Building,
Pittsburgh 22, Pennsylvania.

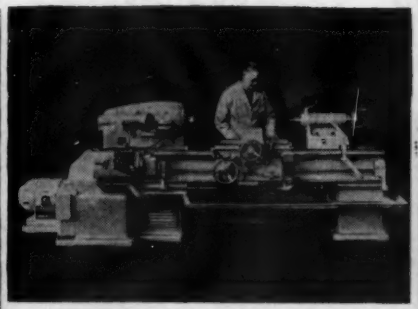
Representatives in principal cities.

Monarch

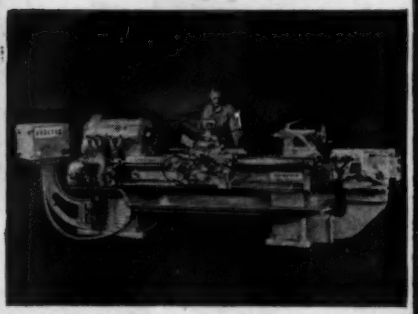
THE MONARCH MACHINE TOOL

Monarch Lathes!

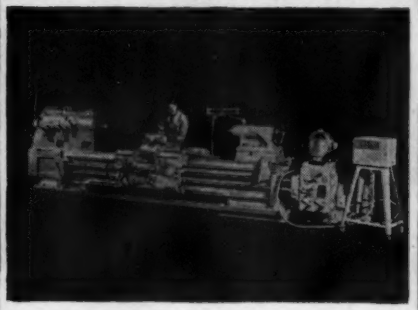
12″ x 30″ Stepless Spindle Speed Drive Lathe with constant surface cutting speed



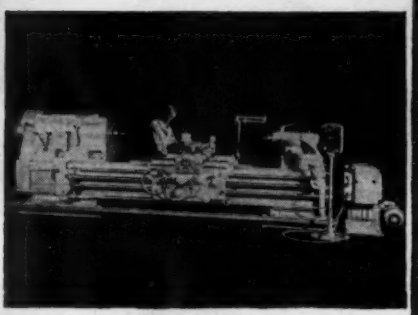
20″ x 48″ Stepless Spindle Speed Drive Lathe with constant surface cutting speed



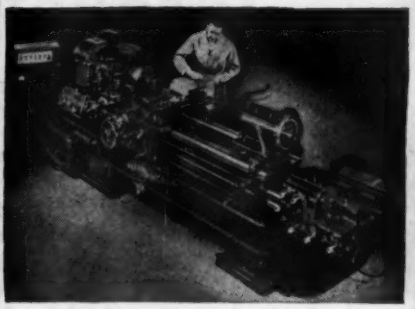
16″ x 54″ Monarch-Keller Lathe



36″ x 60″ Monarch-Keller Lathe



36″ x 60″ Monarch Automatic Sizing Machine



SHAPEMASTER with Keller Electric Controls

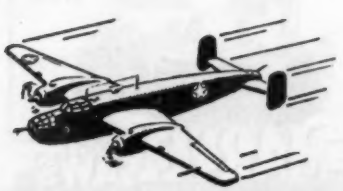
Standard Monarch SHAPEMASTER

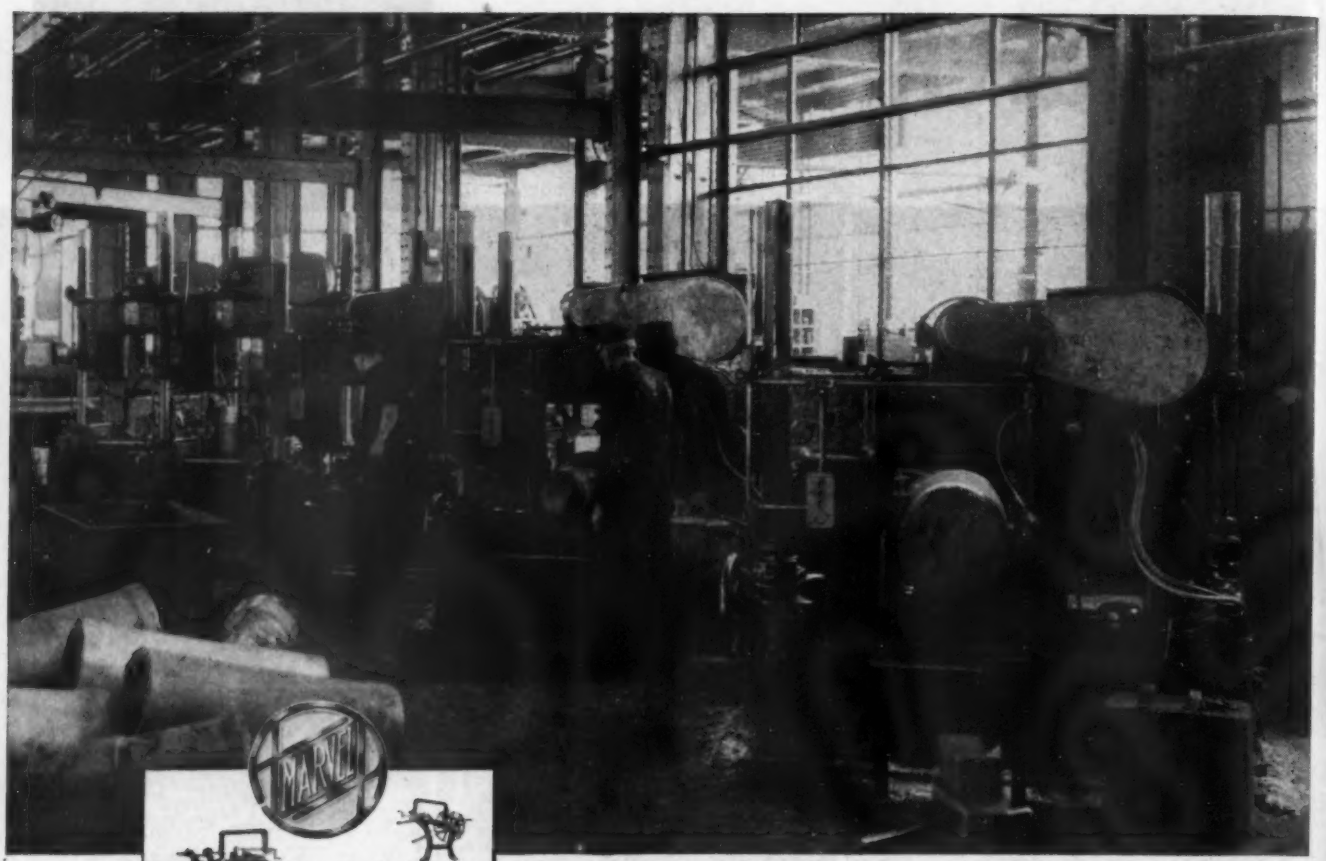
Monarch All-Electric Full Automatic Lathe

24″ x 84″ Monarch Lathe; also made in size 21″ x 84″

18″ x 48″ Monarch Toolmaker's Lathe; also made in size 20″ x 48″

Saves Time





HACK SAW METHOD STEPS UP LOCOMOTIVE PRODUCTION

In the large shops of the American Locomotive Co., at Schenectady, wartime production has reached a new peak.

Among the improved methods contributing to this record output has been the increase in the use of the modern MARVEL Hack Saws for cutting-off even the largest work; for cutting-off car axles, wrist pins and all large forgings — work formerly done with more expensive methods and costlier equipment. One of the first to discover the efficiency and economy of the hack saw method for large work, this company ordered three No. 18 MARVEL Giant Hydraulic Hack Saws soon after these revolutionary Saws were first announced. Today, they are using twenty MARVEL Sawing machines, including eleven of these massive, ruggedly built, giant hydraulics.

MARVEL Saws are increasing the production of war materials in all parts of the country by rapidly, accurately and economically cutting-off the toughest steels in cross sections up to 24" x 24". If you have metal sawing problems, call on the local MARVEL Engineer to recommend methods and equipment.

ARMSTRONG-BLUM MFG. CO.

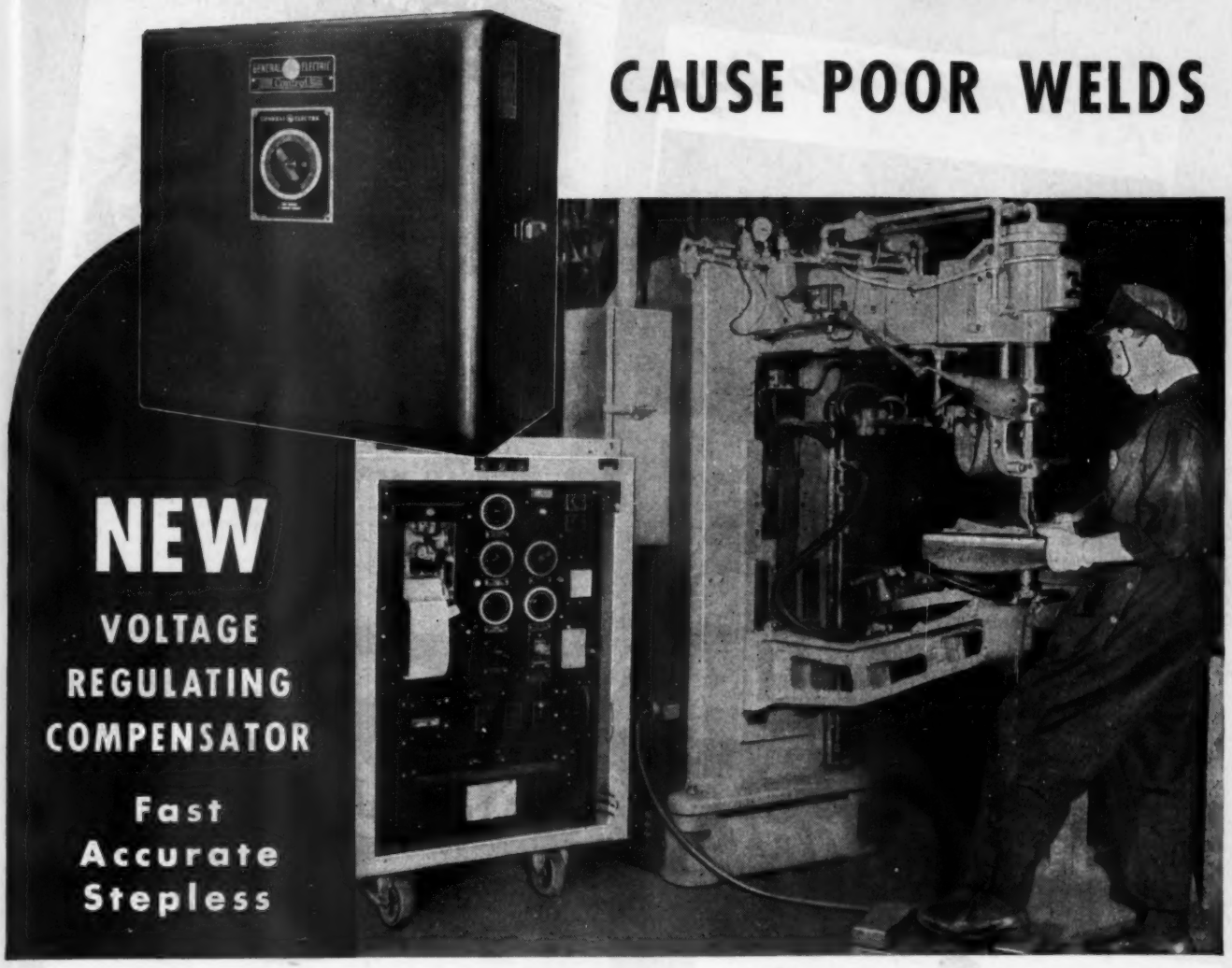
"The Hack Saw People"

5700 W. BLOOMINGDALE AVE. CHICAGO 39, U.S.A.

Eastern Sales Office: 225 Lafayette St., New York 12, N. Y.

MARVEL SAWS

DON'T LET LINE-VOLTAGE VARIATIONS CAUSE POOR WELDS



Helps insure good welds by holding the current constant

THIS electronic compensator, for use with G-E resistance-welding controls, automatically regulates weld current, holds it constant, regardless of line-voltage variations.

1. **ACCURACY OF OPERATION**—The weld current is held within plus or minus 2 per cent of the preselected value, for variations in line voltages of plus and minus 20 per cent.*

2. **SPEED OF COMPENSATION**—If there's a sudden change in line voltage, this compensator will correct for 75 per cent of the change in 1 cycle, provide 100 per-cent correction within 3 cycles.

3. **RANGE OF CONTROL**—Functions over the entire heat-control range of the main control circuit. This range is normally from 20 to 100 per cent for 460- to 575-volt applications, and 40 to 100 per cent for 230-volt applications.

**This allowable voltage deviation may be limited by your other electronic controls.*

Buy all the BONDS you can—and keep all you buy

The voltage-regulating compensator is built into the bottom of this G-E control. In the welding of airplane parts, this compensator keeps the welding current uniform when other machines "hit" the line and cause a voltage drop.

RESISTANCE-WELDING CONTROL

Want more information?

General Electric Company, Sec. A645-31
Schenectady 5, N. Y.

Please send me a copy of your bulletin (GEA-4223) which will tell me more about compensating line-voltage variations.

Name .....

Company .....

Address .....

.....

8960

GENERAL ELECTRIC

-KEEP THAT GUARD UP!

It is not all over but the shouting. • We can still lose. • Ships are yet to be launched that will win the war. Planes are yet to be built that will win the war. Bonds are yet to be bought that will win the war. • Keep that guard UP, America! This fight isn't over, yet. And a referee's decision won't do. We've just got to win . . . by a knockout.

GENERAL MACHINERY CORPORATION

HAMILTON, OHIO

THE NILES TOOL WORKS CO.

THE HOOVEN, OWENS, RENTSCHLER CO.

GENERAL MACHINERY ORDNANCE CORPORATION

IT IS NOT "ALL OVER BUT THE SHOUTING"

-KEEP THAT GUARD UP!

The score in this war is far, far from conclusive. Production, colossal a year ago, must be greater. More ships, planes, tanks — more of all weapons of war — are needed. Anything can happen. We can still lose. Or win. General Machinery Corporation believes in keeping that guard up . . . and we're making the engines, cannon, machine tools for the finish.

GENERAL MACHINERY CORPORATION

HAMILTON, OHIO

THE NILES TOOL WORKS CO.

THE HOOVEN, OWENS, RENTSCHLER CO.

GENERAL MACHINERY ORDNANCE CORPORATION

★ KEEP THAT GUARD UP!

IMPORTANT—

KEEP THAT GUARD UP!

-KEEP THAT GUARD UP!

Keep that guard up, America. • One opponent out means there's one left to beat. • We can only win by two knockouts. • Meantime, the cannon, steam and diesel engines, heavy machine tools from General Machinery Corporation are in there punching.

GENERAL MACHINERY CORPORATION

HAMILTON, OHIO

THE NILES TOOL WORKS CO.

THE HOOVEN, OWENS, RENTSCHLER CO.

GENERAL MACHINERY ORDNANCE CORPORATION

GENERAL MACHINERY CORPORATION

HAMILTON, OHIO

THE NILES TOOL WORKS CO.

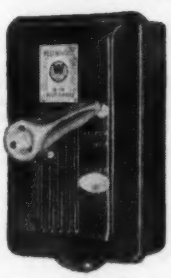
THE HOOVEN, OWENS, RENTSCHLER CO.

GENERAL MACHINERY ORDNANCE CORPORATION

Wild arcs tamed *Quick!*

CALLING THE TRICK is the job of this Westinghouse Bi-metal Element. Two metals which react differently to heat are bonded together. Threatening overloads cause the Bi-metal to bend, tripping the interrupting mechanism and opening the circuit—*before* any damage is done.

TAMING THE ARC is the job of the "De-ion" arc quencher. It consists of parallel metal plates in the form of a grid. The arc is drawn into the quenching chamber . . . divided into segments . . . smothered between the plates—in the space of a half cycle.



When current's on the rampage, a circuit breaker has to function *fast* and *sure*—every time!

Westinghouse "De-ion" Circuit Breakers are built for just such hair-trigger protective action. They pass harmless overloads without interruption, but let danger threaten, and quicker than a blink of the eye—the circuit's opened . . . the arc is quenched. Burns and pits are minimized; contacts stay cleaner, last longer.

Once the disturbance is cleared, service is instantly restored by a flip of the indicating handle. No waiting—no repairs—no parts to replace.

Protect equipment and circuits with Westinghouse "De-ion" Circuit Breakers. Ratings up to 600 amperes; enclosures for nearly every type of service. Call your Westinghouse Representative today. Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., Dept. 7-N.

J-21298

Westinghouse

PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

"DE-ION" CIRCUIT BREAKERS

This unique piece of metal

KENNAMETAL TIPPED TOOL - STYLE NO. 12

PIECES MACHINED WITH KENNAMETAL-TIPPED TOOLS

KENNAMETAL WEAR-RESISTANT PARTS

KENNAMETAL INSERTS ON TABLE GRINDER

SOLVES MACHINING PROBLEMS..

"Too tough to machine, too hard to work"—time and again these words by production men sounded the death knell of designers' specifications. That is, until the discovery of Kennametal, the unique cemented carbide composition whose amazing hardness immediately established it as a tool material that makes practically any metal easy to cut. Kennametal-tipped tools swept away traditional machining limitations—making practical the cutting, boring, and milling of materials up to 550 Brinell at speeds that multiply output, and substantially reduce production time and costs. This application of Kennametal is a tremendous aid to better machine design, since it permits the use of tough, hard, lighter-weight parts instead of cumbersome components that were incorporated primarily because of their "machinability." Write for our Catalog 43-C that describes Kennametal tools. Study it with your production men—learn how to use the most advanced metal-cutting technique to improve your designs.

IMPROVES PRODUCT PERFORMANCE . . . .

Incredibly hard Kennametal (80.6 on the Rockwell C scale) delights designers who have been plagued by machine failure caused by abrasive or corrosive wear. Kennametal is up to 250 times as wear-resisting as steel. Its use at strategic points nullifies effects of friction and corrosion, assuring lasting precision performance. Complete Kennametal parts can be manufactured by us for use in your machines. Or—inserts of Kennametal can be easily incorporated into wear-areas. They are supplied . . . (1) accurately formed to desired shape, for brazing and finish grinding in your shop . . . (2) mounted on parts furnished by you, after which finishing is done either by you or by us . . . (3) embodied in complete parts produced by us. Don't let "wear" worry you—write us about your problem, and we'll show you how Kennametal can solve it.

KENNAMETAL

SUPERIOR CEMENTED CARBIDES

KENNAMETAL *Inc.*, LATROBE, PA.

Lowdown... on a HIGH-PRODUCTION team

A Bullard Type "D" Mult-Au-Matic and a Bullard Vertical Turret Lathe turn out airplane engine parts for a famous American builder.

The productive genius of America's builders of airplane engines is nowhere more forcefully evidenced than in the wide use it is making of these two Bullard machines. The unique quality of both of these tools is that they spend MORE time each day in working . . . because LESS time is lost in chucking. On many operations, indeed, they have cut production time to one-third less than the former time of outdated methods. Write today for an estimate.

NEWS FLASH!
Investigate the New Heavier, Larger 34" Mult-Au-Matic

For work 34" in diameter and 23" in height, write for specifications of this new machine. You'll be surprised at the many new features.

THE BULLARD COMPANY

BRIDGEPORT 2, CONNECTICUT, U.S.A.

CLEVELAND

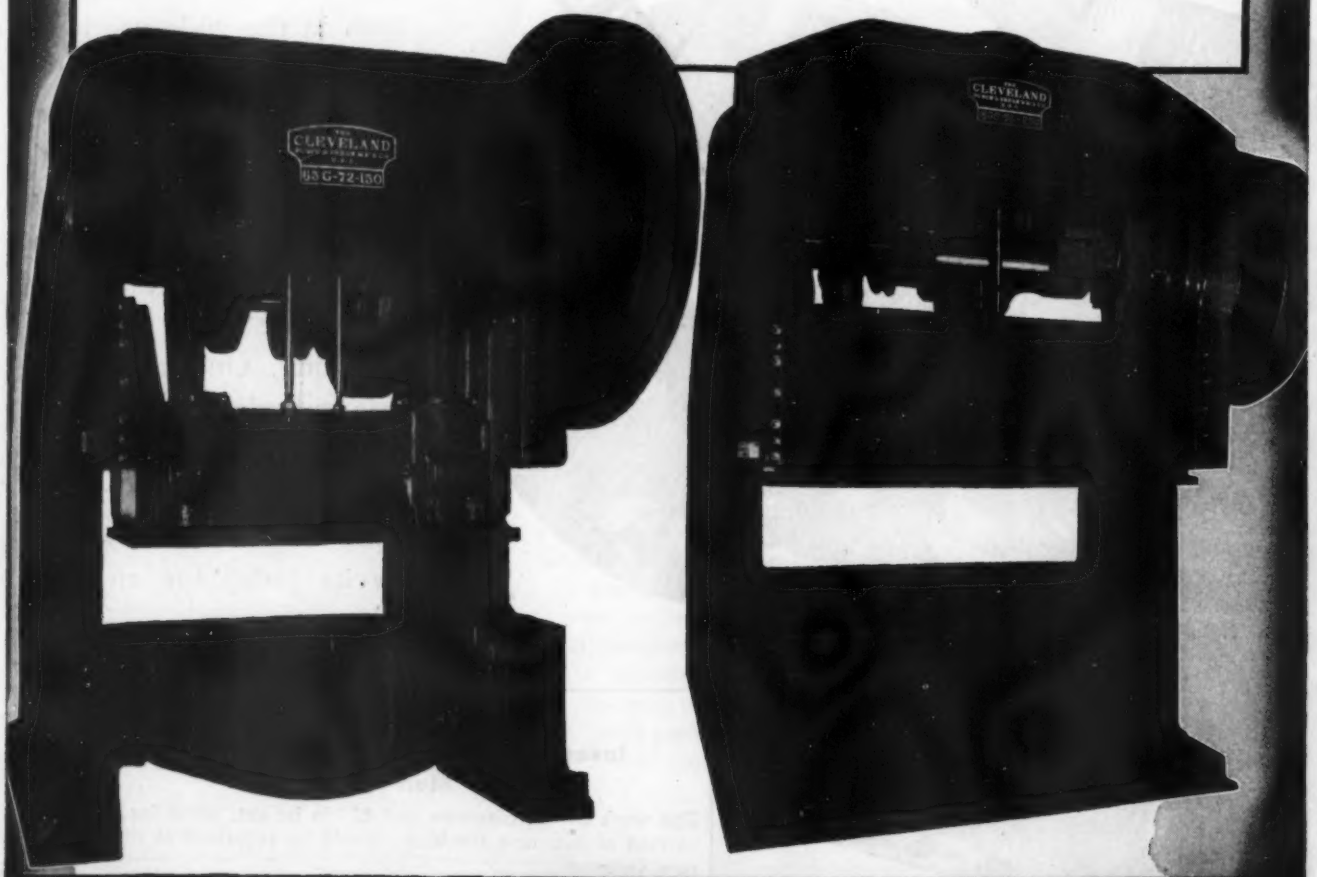
Cleveland Open Back Gap Presses

CLEVELAND Open Back Gap Presses are used extensively for punching, shearing, bending and forming operations and are especially recommended for the convenience which the gap in the housings affords for the handling of large or irregular shapes and for feeding material right and left across the dies.

The illustration on the left shows a 60-G-72 Double Gap Press which has a capacity of 150 tons. The Press is single geared, single end drive and is equipped with an electrically controlled hydraulic clutch. The slide is counterbalanced by air and the flywheel is provided with a separate air brake to bring it to a quick stop. The Press has a bed area of 24" x 72", stroke of 10" and operates at 25 strokes per minute.

The illustration on the right shows an 80-G-96 Double Crank Gap Press having a flush front which permits the use of a table to suit various operating conditions. This Press has a capacity of 250 tons and is equipped with an electrically controlled hydraulically operated friction clutch and brake. The slide is air counterbalanced and the flywheel is provided with a separate air brake to bring it to a quick stop. The face of the slide measures 22" x 100" and the Press which has a 6" stroke, operates at 18 strokes per minute.

Cleveland Open Back Gap Presses can be furnished in either single or double crank and in sizes and capacities to suit requirements.



THE CLEVELAND PUNCH & SHEAR WORKS COMPANY

Cleveland 14, Ohio

NEW YORK • CHICAGO • DETROIT • PHILADELPHIA • PITTSBURGH

THE FITCHBURG METHOD OFFERS . . . SPECIAL MACHINES FROM STANDARD UNITS

Fitchburg automatic multiple precision grinding offers the same profit possibilities that up-to-date shops now earn with multiple tooling and combined cutting on machined work.

Special machines mounting Standard Bowgage Head Grinding Wheel units, like the one illustrated, enable the precision grinding of two or more dimensions at a single handling. Grinding is completed within the time required for the longest single operation. On mass production work these Fitchburg grinders rapidly repay their cost.

On hundreds of parts like those shown, for machine, automotive or ordinance work, Fitchburg engineers can help you to make sure your orders are filled on time, and at the lowest possible cost. It will not obligate you to mail in your blueprints for study. Catalog shows wide range of other successful applications. Write for a copy today on your business letterhead.

When installing special grinding equipment it is important to remember that the Fitchburg Bowgage Grinding Wheelhead is a self-contained standard unit. It can be remounted on standard machines, or on new special bases, for operations other than the one originally specified. This feature protects your investment.

FITCHBURG GRINDING MACHINE CORP.

FITCHBURG, MASSACHUSETTS, U.S.A.

Manufacturers of—Bowgage Wheelhead Units, Multiple Precision Grinding Units, Spline Grinders, Cylindrical Grinders, Gear Grinders, Both Full Universal Grinders and Special Purpose Grinders

"Put it on the Blanchard"

...GET THESE ADVANTAGES

Production ✓
Adaptability ✓
Fixture Saving ✓
Operation Saving
Material Saving
Fine Finish
Flatness ✓
Close Limits

Grinding Aluminum Base Castings

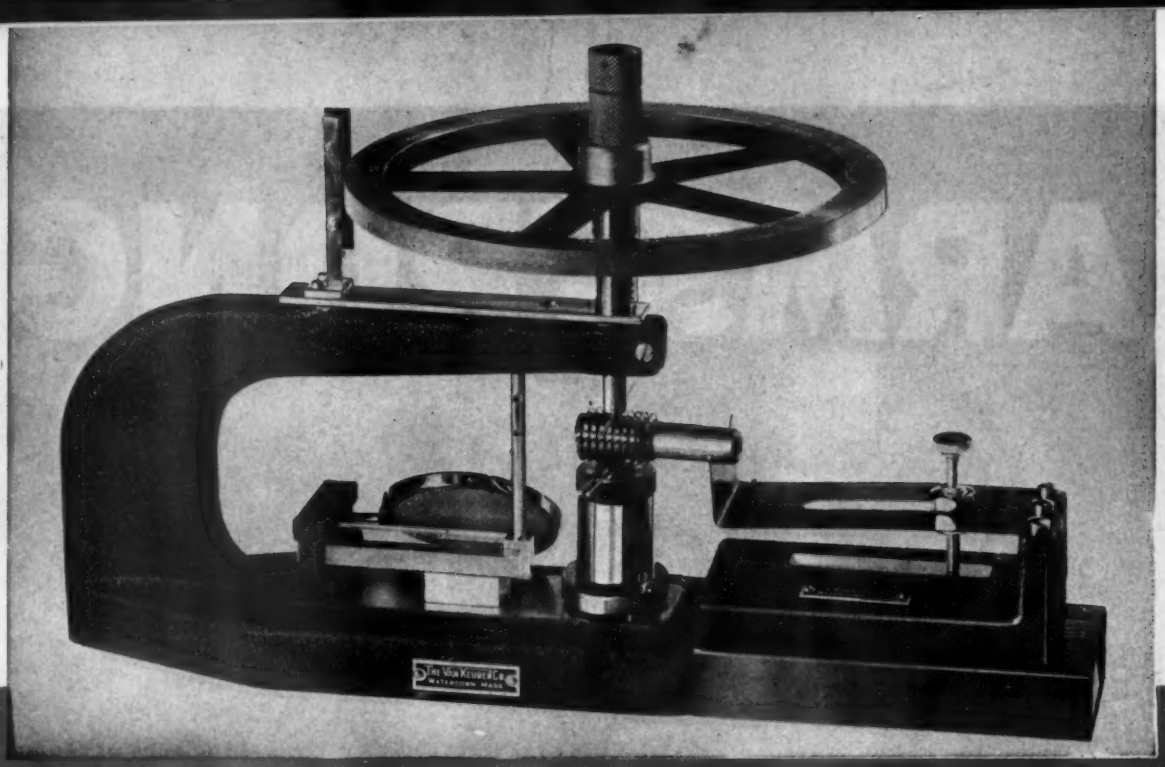
These frail castings are ground on two sides flat and parallel on a No. 18 Blanchard Surface Grinder. They measure 23½" x 21½" x 11" and 5/32" stock is removed from each side. One piece is ground at a time, lightly held by clamps to a steel base plate which is magnetically held on the chuck. Two pieces, four surfaces, are finished per hour.

If you have work, large or small, that requires flatness, squareness, parallelism and fine finish, "put it on the Blanchard" for best and fastest results.

Send for your free copy of "Work Done on the Blanchard." This book shows over 100 actual jobs where the Blanchard Principle is earning profits for Blanchard owners.

BLANCHARD

The BLANCHARD MACHINE COMPANY
64 STATE STREET, CAMBRIDGE 39, MASS., U. S. A.



Van Keuren LIGHT WAVE MICROMETER FOR SUSTAINED ACCURACY

New System of Accuracy—The VK light wave micrometer is an instrument which has formed the basis for an entirely new method of maintaining high standards of accuracy. No gage blocks are required. Errors from worn gage blocks will not be constantly duplicated in the product.

A calibration chart showing the micrometer screw corrections to .00001" is furnished with each instrument. The new type of hardened and ground precision micrometer screw actually improves with use. Fine workmanship and carboloy wearing surfaces make the instrument accurate and dependable for years of constant service.

Controlled Pressure Assures Uniformity — By using the sensitivity of light waves the VK light wave micrometer insures the exact duplication of measuring pressure by any operator. This controlled pressure feature makes it possible to measure hard or soft materials, and for readings to be duplicated by different operators to .00001".

Ideal for Shop Measurements — The VK light wave micrometer is ideal for making measurements by the 3 wire method, for measuring plug gages, measuring wires, precision parts and shop standards. It is a reference instrument. Forget about comparative measurements with gage blocks—use the VK light wave micrometer. It is fast, accurate and profitable.

The VK light wave micrometer is described in full in our manual of precision measuring equipment. This book also gives complete tables and simplified formulae for measuring all standard threads, splines and spur gears. Write for your copy!

Van Keuren

25th YEAR

E CO., 176 WALTHAM ST., WATERTOWN, MASS.

Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper Insert Plug Gages • Wire Type Plug Gages • Measuring Wires • Thread Measuring Wires • Gear Measuring System • Shop Triangles

ARMSTRONG

Tool Completely for War Production and be Completely Tooled for Post-war Competition

With the correct ARMSTRONG TOOL HOLDERS you can greatly increase (often double) speeds and feeds of every operation on lathes, planers, slotters, shapers, turret lathes and screw machines—can materially increase the output of war materials and keep speed victory.

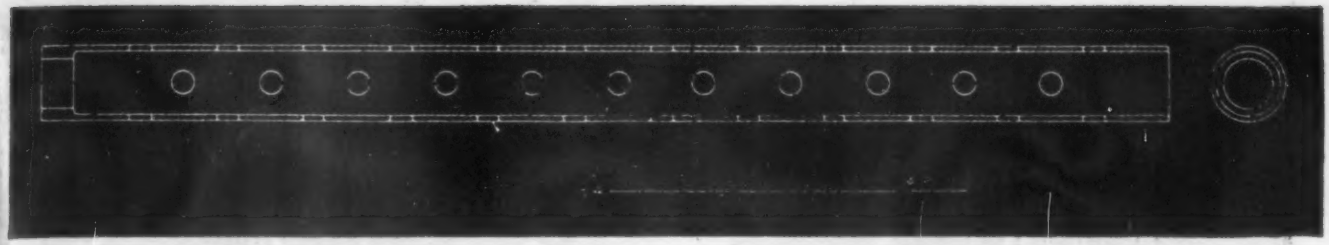
With the same ARMSTRONG TOOL HOLDERS you will be prepared to instantly start on your post-war program, once victory is won, for each is a permanent, multi-purpose tool that does the work of a complete set of forged tools—that reduces tooling-up to the selection of a cutter and tightening of a set screw . . . that "Saves: All Forging, 70% Grinding, and 90% High Speed Steel."

Equip all machine tools with their complete complement of ARMSTRONG TOOL HOLDERS now, to increase war production, and to be ready for post-war competition.

ARMSTRONG BROS. TOOL CO.
"The Tool Holder People"
315 N. Francisco Ave., Chicago 12, U.S.A.

Eastern Warehouse and Sales
199 Lafayette St., New York 12, N. Y.

Buy ARMSTRONG TOOLS from your Supply House



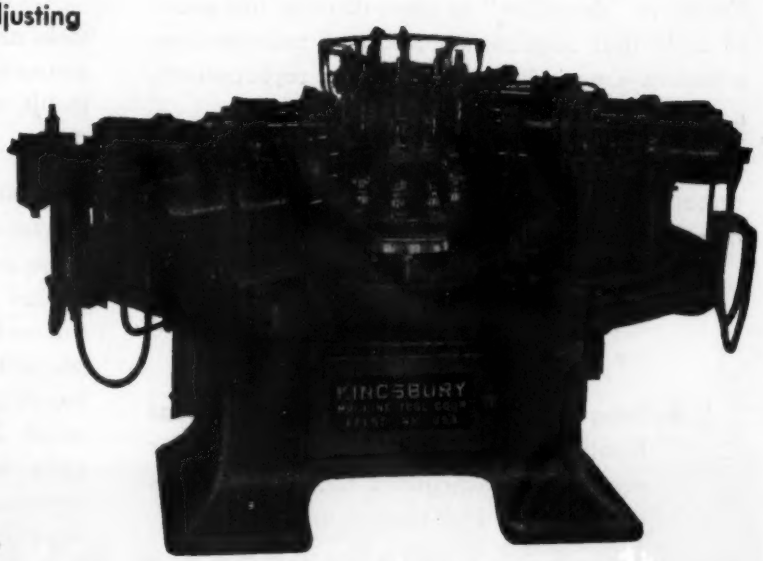
A FLEXIMATIC

by KINGSBURY

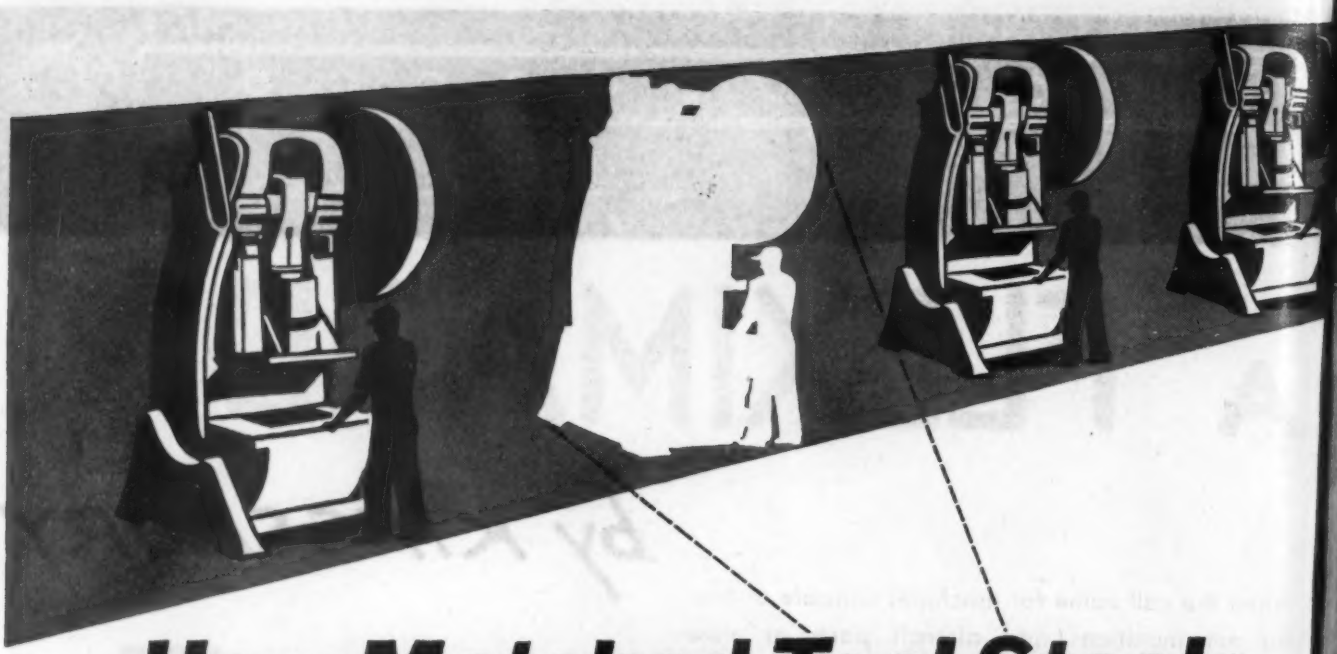
JOB ... SPEEDING NAVAL ORDNANCE PRODUCTION!

When the call came for machines capable of turning out munitions and aircraft parts at mass-production speeds, Kingsbury FLEXIMATICS were ready! Quickly made up of standard units mounted on standard bases. FLEXIMATICS can perform drilling, tapping, reaming and many other operations in **any** position or at **any** angle on **any** part that can be chucked. For example, all 48 holes are produced in the flash tube shown above in a single chucking of the work. Each work holder on the main turret is in itself a turret which indexes as the main turret indexes, thus enabling the rows of holes to be drilled at four positions on the tube without removing the work. Various lengths of tube can be handled by the machine by adjusting the position of the top clamping member.

Speeding war production by making it possible for semi-skilled labor to turn out large volumes of precision parts, Kingsbury FLEXIMATICS possess the added advantage of FLEXIBILITY that permits quick, easy changeovers to meet changes in design or machining requirements.

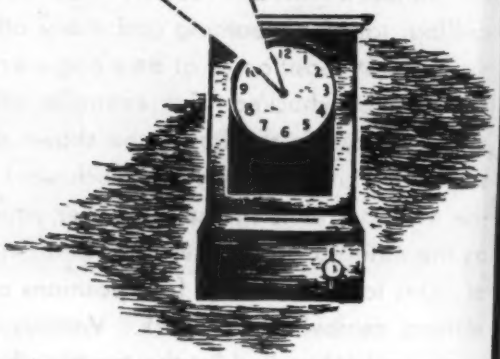


KINGSBURY MACHINE TOOL CORPORATION
KEENE, NEW HAMPSHIRE



How Matched Tool Steels

Reduce "downtime" and cut unit costs...



● Whenever a machine or press must be stopped —output stops—and unit costs go up. The more "downtime", the higher those unit costs go.

Excessive "downtime" is often directly traceable to tools that require too frequent maintenance attention—regrinding, repairing or replacement.

Many a man responsible for tools has made the discovery that much tool-caused "downtime" is unnecessary and can be eliminated — with the help of Carpenter Matched Tool Steels.

1. Because these 9 Tool Steels simplify selection—and help you get the right tool steel for maximum service on each job.

2. Because correct and easy-to-use heat treating instructions are furnished for each steel to safeguard hardening results and step up tool performance.

These advantages make Carpenter Matched Tool Steels easier to use in the tool room—and assure tools and dies that stay on the job—work more consecutive hours with less maintenance. The result is higher machine output and lower unit costs.

Carpenter Matched Tool Steels are available from conveniently located warehouse stocks. A 168 page manual provides a handy, convenient way to find the right steel for each job and supplies full and complete information on analysis, physicals, working properties, and heat treatment. This manual is available from your Carpenter representative. Ask him for a copy—or write us on your company letterhead, giving position or title, please.

The Carpenter Steel Company · 109 W. Bern Street · Reading, Pa.

TOOL: Special Punch

FEWER PUNCH REGRINDS
14,720 MORE PIECES PER SHIFT

THE JOB: A high speed press operation with a 4 gang punch setup. Washers for military use were produced from highly abrasive rubberized sheet asbestos. To maintain close tolerance and cut clean required three shut-downs daily to regrind punches.

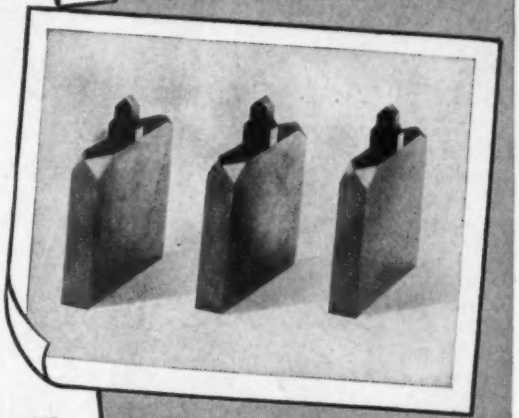
MATCHED SET RESULTS: By the Carpenter Matched Set Method a steel was selected for maximum abrasion resistance—number of shut-downs for grinding tools was cut from three to one per machine per day. Output increased 14,720 pieces per day. Three hours of tool room time saved every day for each press by reduction in punch regrinding.

TOOL: Swaging Die

TIME BETWEEN GRINDS TRIPLED
PRODUCTION PER SHIFT UP 2344 UNITS

THE JOB: A large production swaging operation in which a grooving knife was used to work SAE 6150. Excessive wear required resharpening of grooving knife once a day.

MATCHED SET RESULTS: From the Carpenter Matched Set of tool steels a steel was selected to give maximum wear and hardening accuracy. Production time between tool regrinds was more than tripled and each 8 hour shift production increased an average of 2344 units.



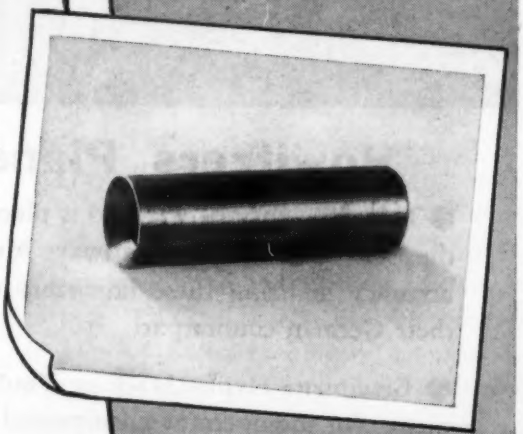
TOOL: Sizing Die

PRODUCTION INTERRUPTIONS CUT 75%
1800 MORE PIECES PER SHIFT

THE JOB: An extruding operation whereby a flux coating is applied to welding wire. A sizing die in the hydraulic press insured application of a uniform wire coating. Dies had to be replaced every two hours because of the abrasive wear:

MATCHED SET RESULTS: A Carpenter Matched Tool Steel was selected for greatest wear resistance with these results:

1. Production stoppages to replace dies, cut from 4 to 1 per day.
2. Die life was increased by 400%.
3. 1800 more pieces of vitally needed welding rod were produced per shift.



Carpenter **MATCHED TOOL STEELS**

...NCHES AT Chicago, Cleveland, Detroit, Hartford, ...ouis, Indianapolis, New York, Philadelphia

Howitzers Planed On a Cincinnati Hypro

● This 48" Cincinnati Hypro is planing the inside profile of a gun slide for 5.5" howitzers at the Canadian National Railways Munitions Plant at Montreal. Accuracy in planing means accuracy in firing these howitzers which throw a 100 pound projectile much farther than their German counterpart.

● Cincinnati Hypro Machine Tools provide accuracy, rigidity, ease of control and convenience for the operator unsurpassed in tools of their size. It is to your interest to replace old equipment of antiquated design with modern Hypro Machine Tools containing the latest HYPRO-duction features. Write for Bulletin 136 describing and illustrating Cincinnati Double Housing Planers.

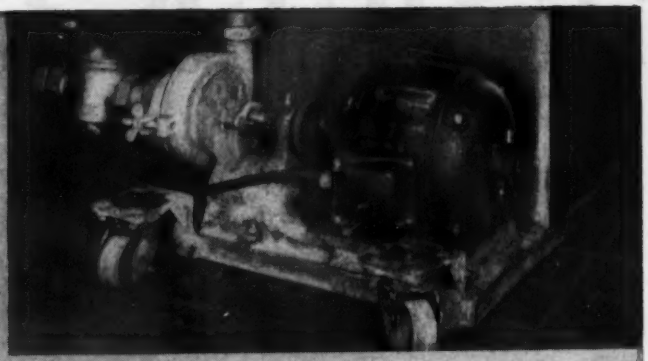
Photo by Canadian National Railways

THE CINCINNATI PLANER COMPANY

Planers...Vertical Boring Mills...Planer Type Millers

CINCINNATI . OHIO . U.S.A.

DOUSED DAILY!



G-E Tri-Clad motor coupled to a centrifugal pump on a portable cleaner in the milk plant of H. P. Hood & Sons, Inc., Charlestown, Mass.

POWERING A DAIRY PUMP, this Tri-Clad splashproof motor gets a dousing every day as the plant is hosed down. After years of service, frame and end shields are virtually uncorroded, insulation is going strong. G-E "protection tests", both in the development of the Tri-Clad design and in our daily production, help us assure you of long-lasting service from Tri-Clads on motor-wracking jobs like this.

"Hot Box" at 100% humidity tests TRI CLAD motor protection

REG. U.S. PAT. OFF.

Here is one of the many development tests which helped to prove the *extra* stamina engineered into the Tri-Clad design. In the bottom of this moisture box, just below the motor base, two inches of water was maintained at 212 F. The cover kept the humidity within the box at 100 per cent. By operating motors in this atmosphere to the breakdown point, G. E. got the low-down on the coil insulation's moisture resistance. Tri-Clad motors, in both open and splashproof construction, showed up unusually well in this extra-severe test. *General Electric Company, Schenectady, N. Y.*

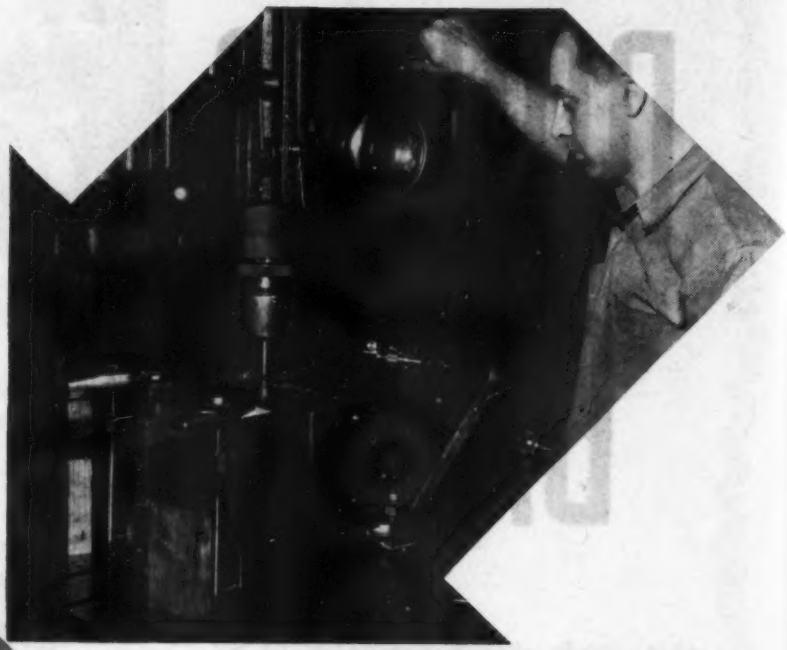
GENERAL ELECTRIC

TRI CLAD MOTORS

Every week more than 192,000 G-E employees purchase more than a million dollars' worth of War Bonds.

FOSDICK JIG BORER

MEETS AND HOLDS RIGID TOLERANCE REQUIREMENTS



● The rigid construction of the Fosdick Jig Borer from base to column top assures continued accuracy when operating at full capacity.

Its ability to meet and hold close tolerances makes it ideal for both tool room and tool and die shop work.

For a medium-priced machine, it has proved most economical in producing small lots on which the cost of jigs and fixtures would be prohibitive.

In short it provides every opportunity for producing precision work inexpensively and efficiently.

The machine shown is being used by Buhr Machine Tool Co. and shows a typical operation on which several holes are within reach of the spindle by merely moving the table with handwheel.

If you have work requiring precision drilling, boring, reaming or similar operations put it on a Fosdick Jig Borer for accurate results—greater production—and lower costs.

Complete details and operating examples fully explained in the Fosdick Jig Borer bulletin J.B.A. Write for your copy today.

FOSDICK MACHINE TOOL COMPANY
CINCINNATI 23, ··· OHIO

is one of many structural shapes being produced by American Magnesium Corporation. Strong because of its design and the alloy* used—very light in weight because it's magnesium—economical to employ because this extrusion replaces an expensive built-up beam.

There are doubtless many places where structural shapes having the combination of strength and light weight and economy will be advantageous. May we help you determine *where* in your products? Aluminum Company of America (Sales Agent for Mazlo Magnesium Products) 1709 Gulf Building, Pittsburgh 19, Penna.

***AM-C58S-T5*

MAZLO

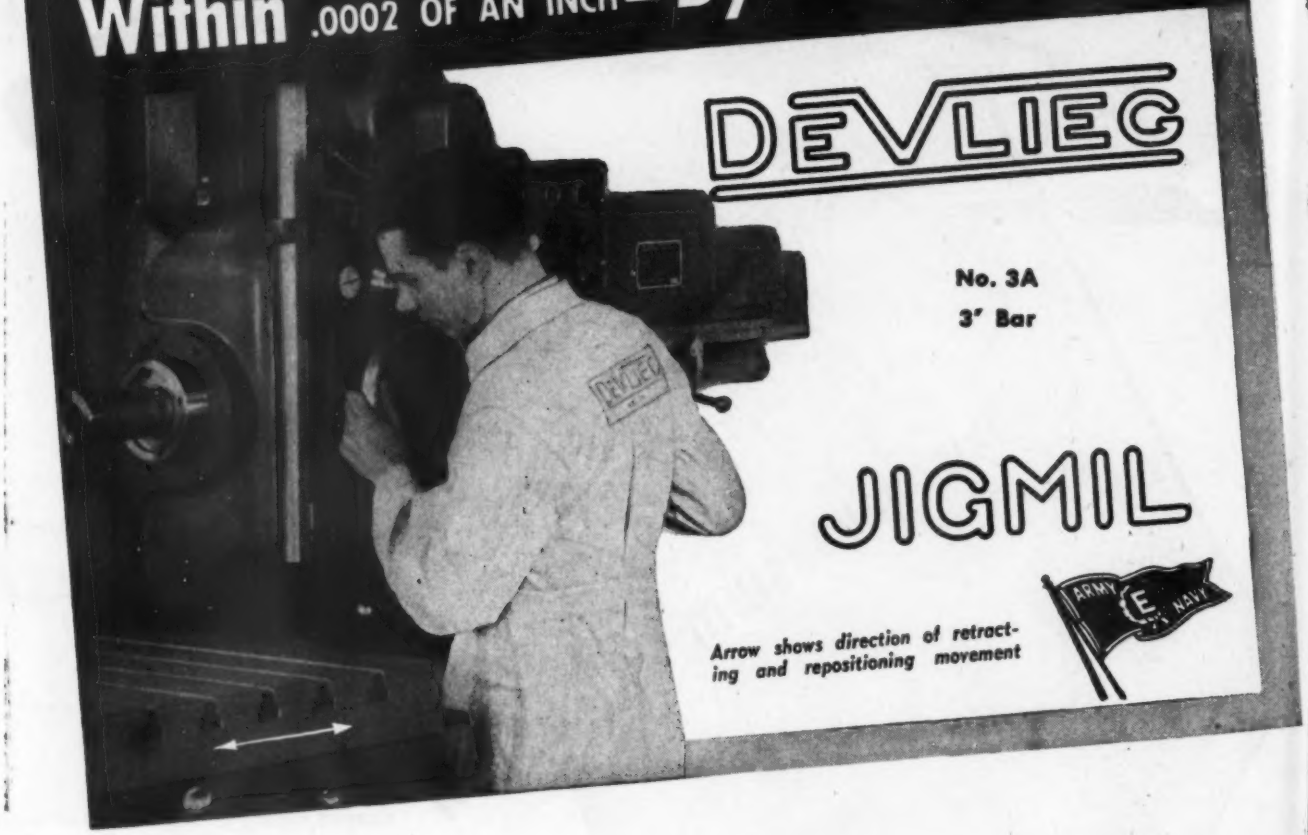
MAGNESIUM PRODUCTS

REG. U. S. PAT. OFF.

AMERICAN MAGNESIUM CORPORATION

SUBSIDIARY OF ALUMINUM COMPANY OF AMERICA

Retracting and Repositioning Work Within .0002 OF AN INCH—By Push Button



The most frequently needed function in a precision boring machine is that of retracting the work to facilitate measuring and tool setting.

In the DeVlieg Jigmil, this function is automatic—by fingertip control. Operation of a push button unlocks the table and moves it by rapid traverse to the desired position for measuring. For repositioning, operation of a single push button will cause the table to return to its cutting position by rapid traverse, stopping and locking automatically. Uniformity of selected position for stopping and locking is dependable within .0002".

The DeVlieg Jigmil is a new type machine—has the spacing accuracy of a Jig Borer—Performance Qualities of a Milling Machine—Convenience and Flexibility of a Horizontal Boring Mill. All control is so centered and organized that the operator never has to take his eyes off the work.

Thus, the Jigmil fulfills the machine tool ideal—a powerful and accurate extension of the operator's hand.

Many machines show 75 per cent greater average daily productivity.

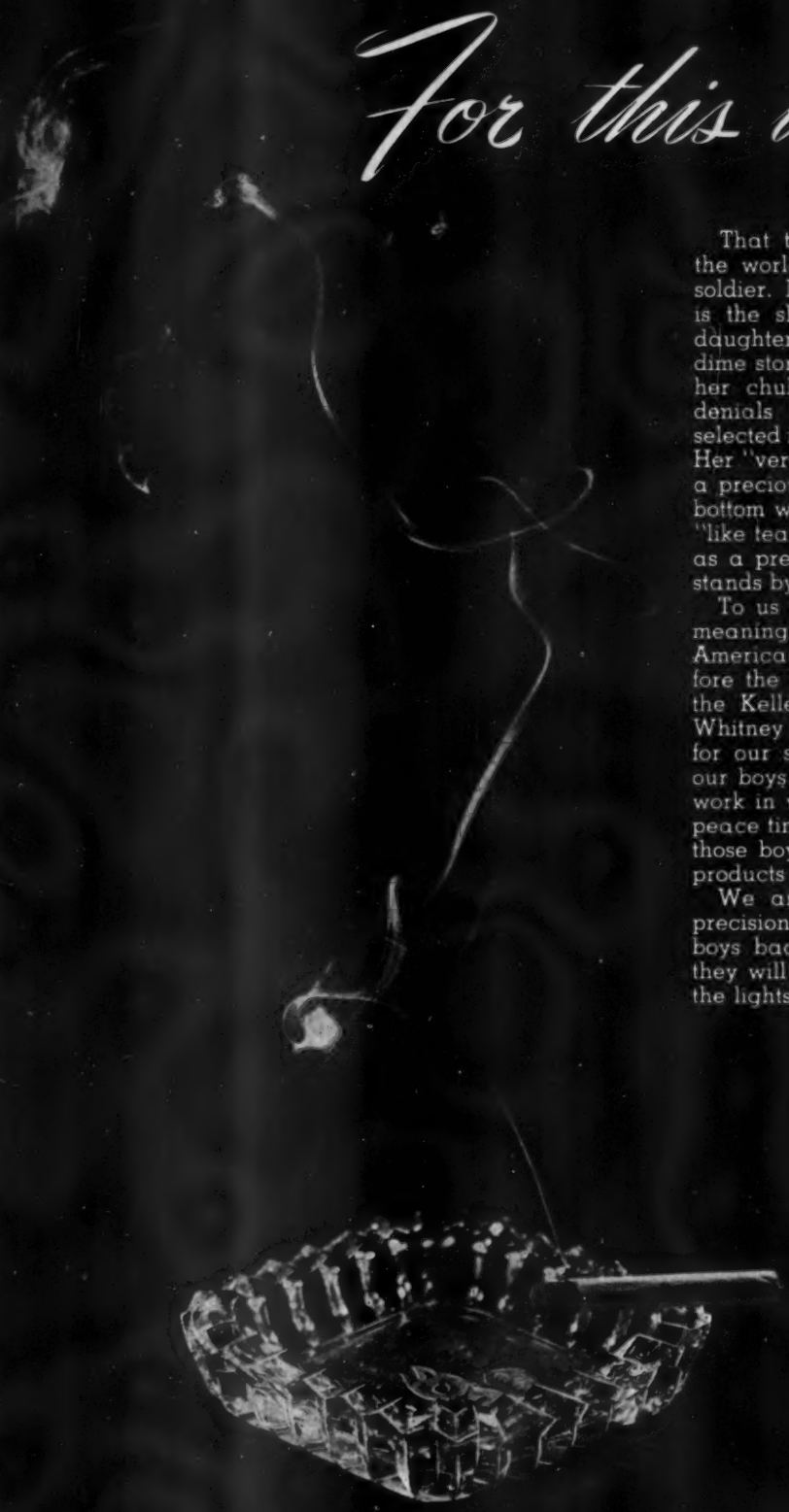
DEVLIEG MACHINE COMPANY

450 FAIR AVE. FERNDALE 20, (DETROIT) MICHIGAN

Write for Circular

DEVLIEG MACHINE TOOLS

For this we fight

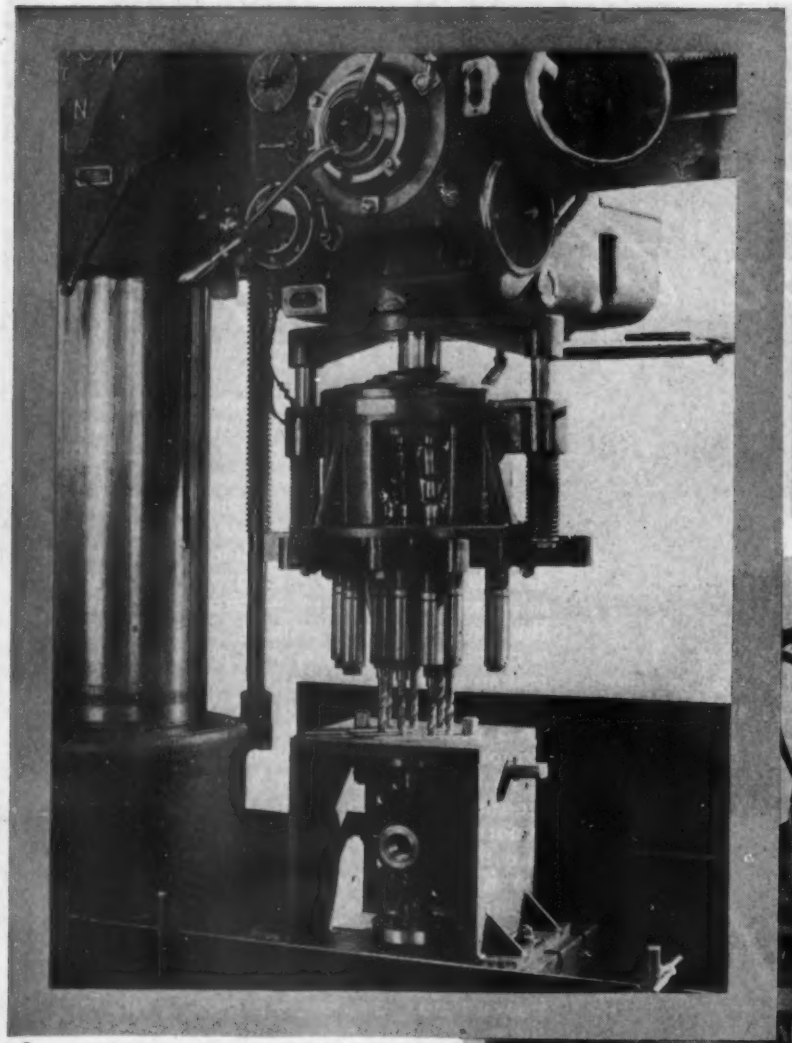


That thread of smoke reaches across the world to the heart of an American soldier. For him that little glass ashtray is the shrine of all he loves. His little daughter had marched proudly into the dime store back home with ten pennies in her chubby fist — ten determined self denials "for Daddy." Gravely she had selected it — paid for it — carried it home. Her "very very best picture," hacked from a precious story book, was pasted on the bottom where it showed through the glass "like teacher said" . . . her very best . . . as a present for Daddy. Small wonder it stands by his chair — waiting —

To us that glass tray holds a different meaning . . . a glimpse of the future America. It was made in a mould cut before the war by one of our machines — the Keller. Today thousands of Pratt & Whitney machine tools are making arms for our soldiers. But when it's over and our boys come back, these machines will work in vast new American industries — peace time industries — providing jobs for those boys and money to buy American products that make life more pleasant.

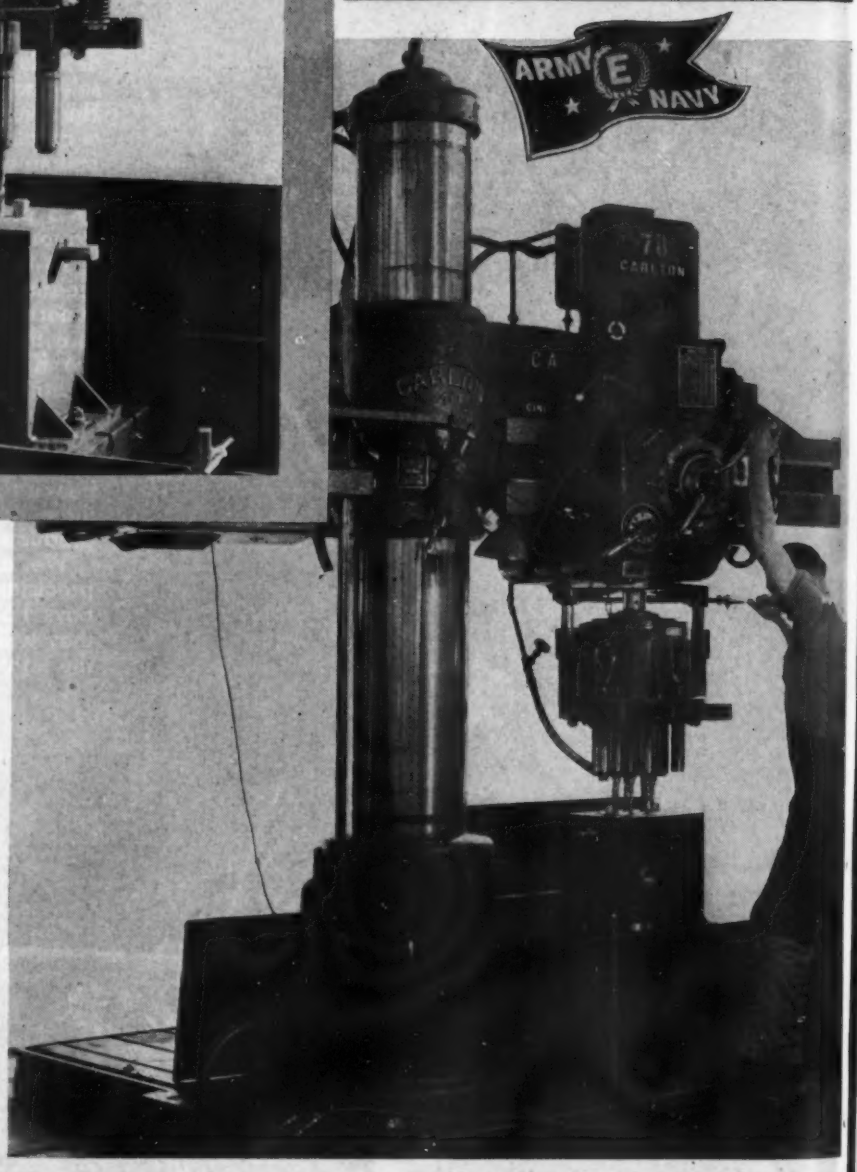
We are proud that Pratt & Whitney precision tools are helping to bring our boys back safely . . . prouder still that they will help guarantee them jobs when the lights go on again.

PRATT & WHITNEY DIV. NILES-BEMENT-POND CO. **WEST HARTFORD, CONN.**



CARLTON RADIAL

increases production 600% on this job!



● The low hung drive with the main driving gears below the arm — driving off the largest diameter of the spindle — makes an ideal drive for a multiple spindle drill head as illustrated.

This is 5 foot — 15 inch column Carlton at the Grove Regulator Company drilling parts for Grove Regulators. On this operation production was increased 600% by use of this Carlton Radial and a multiple spindle drill head.

Thus is demonstrated the production possibilities of this well balanced — high powered — rigidly constructed Radial Drill.

For high production — power — long life and ease of operation put your drilling jobs on a Carlton Radial.

THE CARLTON MACHINE TOOL COMPANY

Manufacturers of RADIAL DRILLS *Exclusively*

CINCINNATI 25, OHIO, U. S. A.

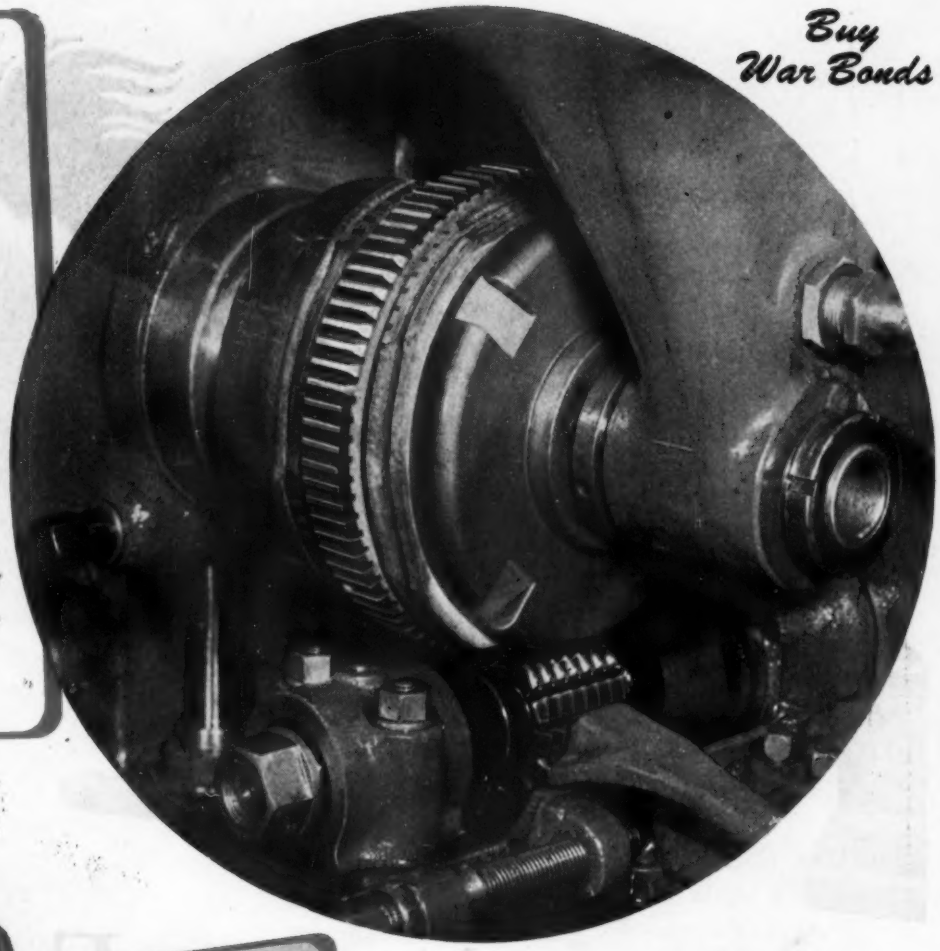
Buy War Bonds

JOB DATA

PART: Valve Timing Gear for Aircraft Engine. MATERIAL: AMS 6240 steel, Brinell-197-170, soft but tough. PIECE: 9" O.D., ¾" face, 80 teeth, 20° P.A., 9-11 pitch, spur form. SET-UP: .080" feed per rev. of work, 82 r.p.m. hob speed. PRODUCTION TIME: 25 minutes per load of 2. CUT: Semi-finishing, to leave .012" stock. HOB: 2¾" x 2¾" x 1¼" straight hole, single thread, ground, non-topping.

HOB LIFE:—3 Settings—20 pieces per setting—60 pieces per grind.

ACCURACY—measurement over .1875" dia. pins held to $\frac{9.150"}{9.160"}$



ANOTHER EXAMPLE OF

BARBER-COLMAN

HOBBING MACHINE PERFORMANCE

CLIMB HOBBING

OF AIRCRAFT ENGINE TIMING GEARS

Here is a good example of efficient production on a large gear of tough material. Two blanks are held together on an air-operated clamping arbor. CLIMB HOBBING is used for better finish because it minimizes the tearing effect usually encountered in such tough material. Barber-Colman Hobbing Machines . . . now demonstrating their accuracy and durability in hundreds of busy war plants . . . will be quickly convertible to peace-time production when the time comes. *Keep your B-C machines in good condition, and they will serve you well for many years.*

TYPE "A" HOBBING MACHINE

The size and type of hobbing machine illustrated here is only one of a wide variety of machines we make for cutting the teeth on spur and helical gears, splined shafts, and other hobbed forms from tiny watch pinions up to heavy tractor drive gears. The Type "A" is a medium-size machine with high accuracy and high production efficiency. For full details, write for Bulletin F-1099.

BARBER B-C COLMAN PRODUCTS

HOBS, HOBBING MACHINES, HOB SHARPENING MACHINES, REAMERS, REAMER SHARPENING MACHINES, MILLING CUTTERS, SPECIAL TOOLS

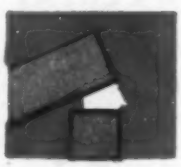
Barber-Colman Company

GENERAL OFFICES AND PLANT • 111 LOOMIS STREET • ROCKFORD, ILLINOIS, U. S. A.

arcs leave this point Fast!

A POINT TO REMEMBER!

LIKE THIS. Diamond-pointed break jaws confine arcing to the point . . . force the arc to break outside the current carrying area. Contact surfaces stay clean . . . don't pit, don't burn.



NOT LIKE THIS. When ordinary safety switches are opened, the arc leaps across the contact areas . . . along the jaws and blade. It hangs on longer, burns and pits the contact surfaces.

When arcs hang fire, switch contacts become pitted and burnt . . . cause trouble. To avoid this, keep the arc away from the contact area—*and* put it out *quick!*

Westinghouse Safety Switches do *both.* The diamond-pointed jaw forces the arc to break outside the current-carrying area. Contacts stay clean, last longer, need less care, provide better protection.

For 575 or 600-volt circuits, Westinghouse provides extra protection—the exclusive "De-ion" arc quencher. Arcs are drawn into the grid chamber—divided—quenched quickly!

Protect circuits with Westinghouse Safety Switches. Ratings up to 1200 amps, 600 volts. Call your Westinghouse Representative today. Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa. Dept. 7-N. J-21299

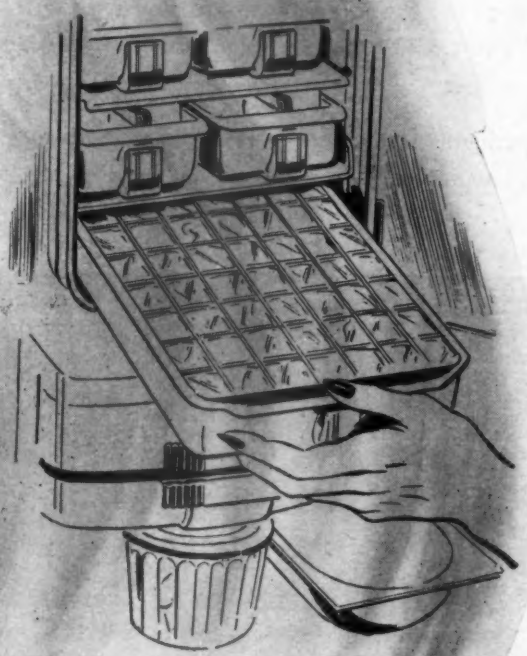
Westinghouse SAFETY SWITCHES

PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

HEAT—

Aluminum helps use or lose it

Heat aluminum at one spot and it's soon hot all over; this metal's such an excellent conductor of heat. Manufacturers of appliances take advantage of this property of aluminum to insure uniform heating, where they're employing heat, or to dissipate it, where heat isn't wanted.



The aluminum flatiron sole plate is a highly efficient worker of the first class. You get quick, even heating without hot spots. Refrigerator ice cube trays and grids carry heat away rapidly, giving faster freezing.

This property of aluminum has proved extremely valuable in such wartime products as intercoolers and oil coolers on airplanes, superchargers on Diesels and heat exchangers in processing equipment. The ability of aluminum to speed dissipation of heat led to its early adoption for automotive and airplane engine pistons and cylinder heads. Postwar planners are incorporating aluminum in their designs for these same reasons. Winning the war comes first, of course. But aluminum is now being used for other-than-war purposes, as the manpower situation permits.

Our representatives will be glad to discuss the availability of aluminum with you. Write ALUMINUM COMPANY OF AMERICA, 2107 Gulf Building, Pittsburgh 19, Penna.

ALCOA ALCOA ALUMINUM REG. T.M. **ALUMINUM**

Speeding Deliveries

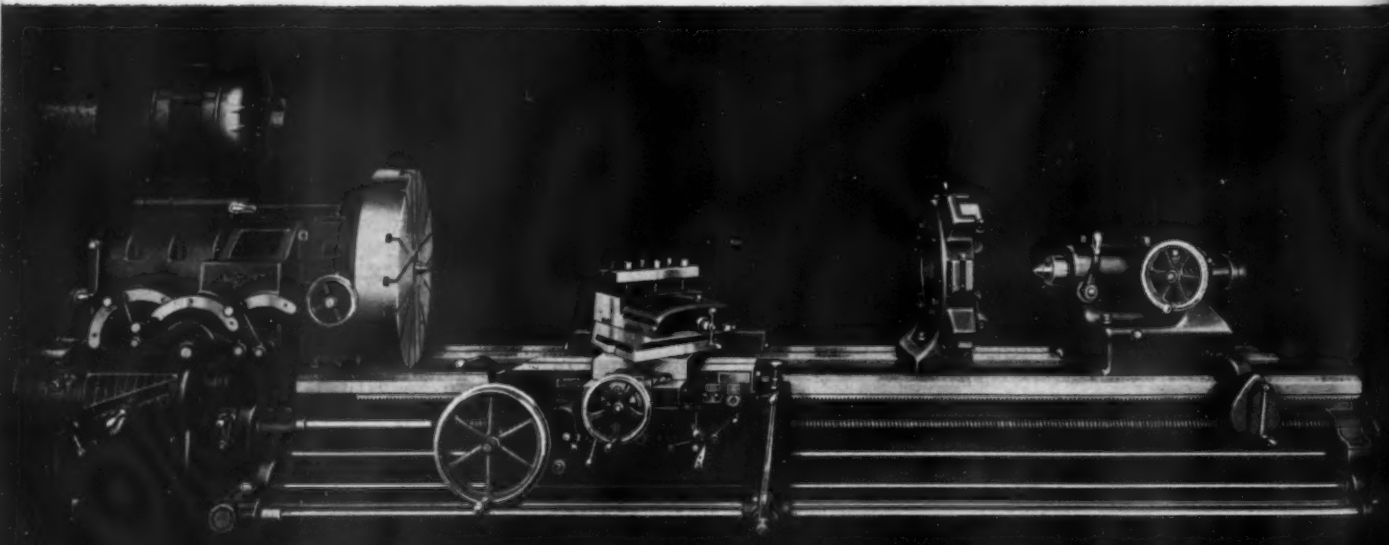
TO THE AXIS !

"American" Lathes are doing a real speed-up job in producing torpedoes for "delivery to the Axis".

Here is one of a battery of 42" "Americans" machining torpedo air flasks with eight tools cutting simultaneously. This job demands power and stamina far in excess of the average lathe job. "Americans" were selected—"Americans" are doing the job.

The Amertorp Corporation, one of the world's largest and finest torpedo manufacturing plants, employs many "American" Lathes for a great variety of torpedo machining operations.

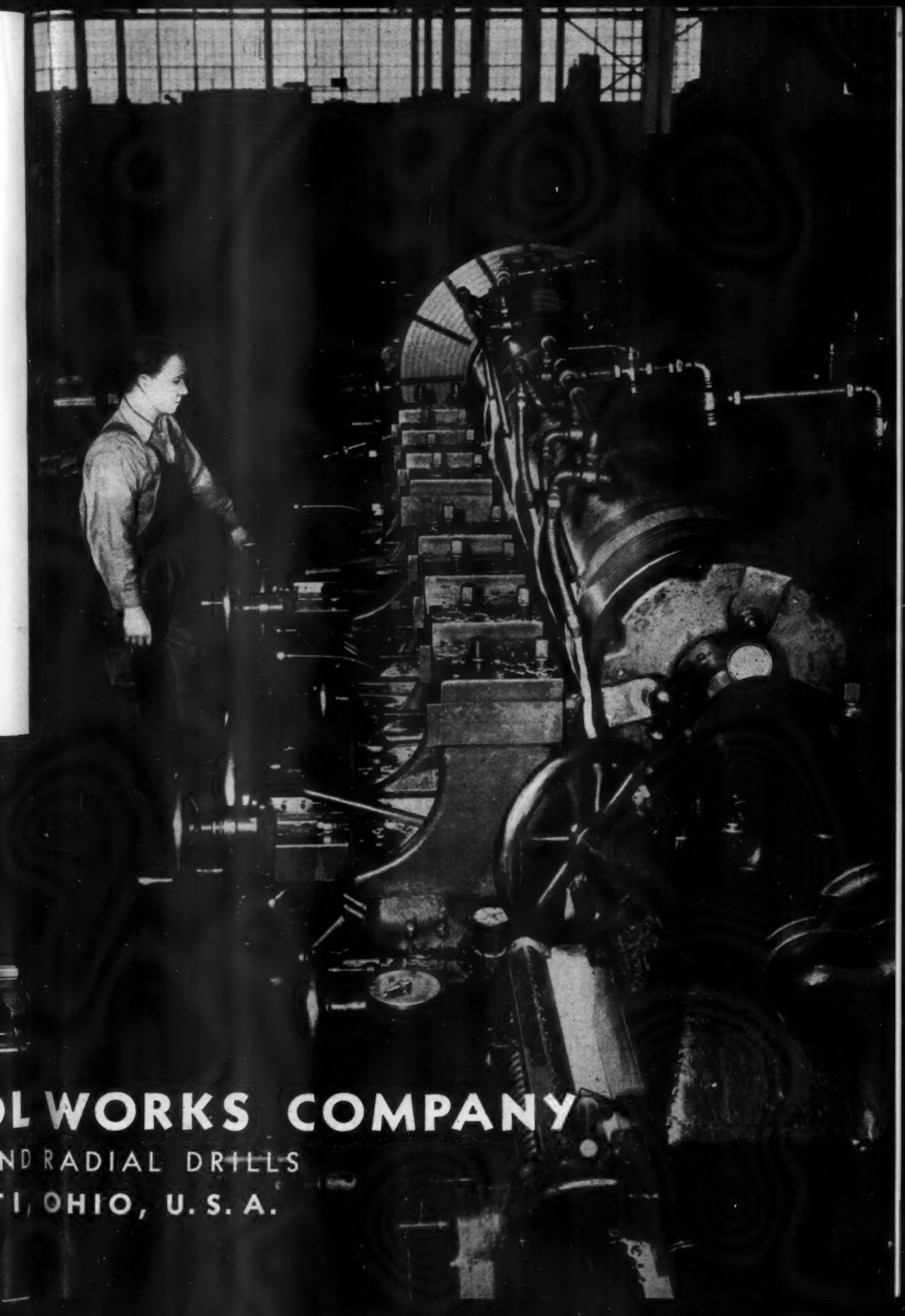
We are proud of the part "American" Lathes are playing in the production of this masterpiece of destruction.



THE AMERICAN TOOL W

LATHES AND RAD

CINCINNATI, OHI



OL WORKS COMPANY

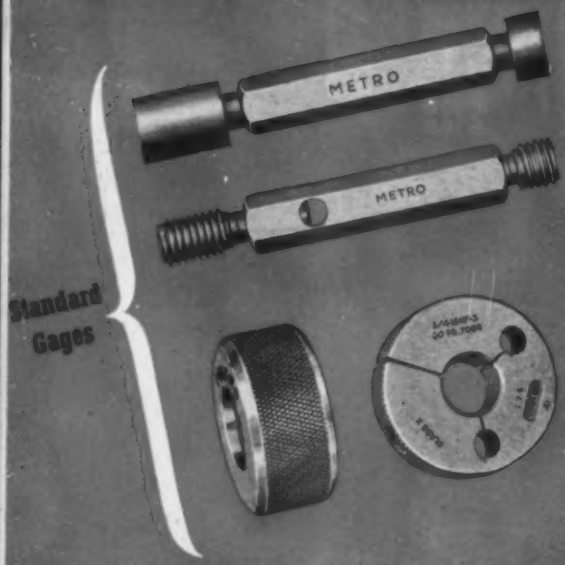
ND RADIAL DRILLS

TI, OHIO, U. S. A.

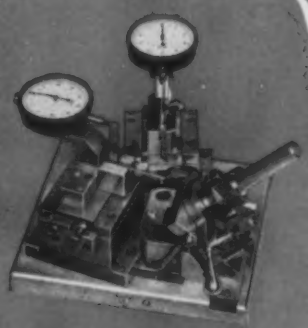
METRO

for Production

and Accuracy



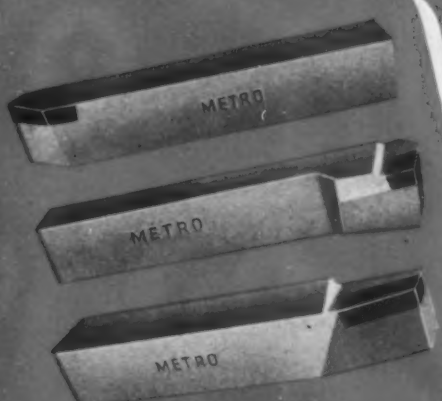
Standard Gages



Special Gages

Master Setting Discs

Carbide Tipped Centers

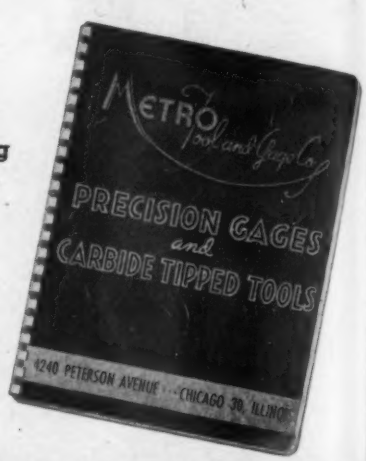


Carbide Tipped Tools

Looking for improved production speed and accuracy? These METRO Standard and Special Carbide Tipped Tools and Precision Gages are ready to tackle your tough assignments . . . with proved accuracy and adaptability.

Be sure. Select METRO . and you select the best.

Write for new METRO Catalog No. 102 today



ARMY E NAVY

METRO

TOOL AND GAGE CO

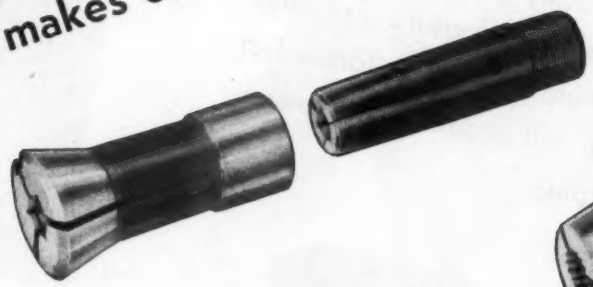
4240 PETERSON AVE.

CHICAGO 30, ILL.

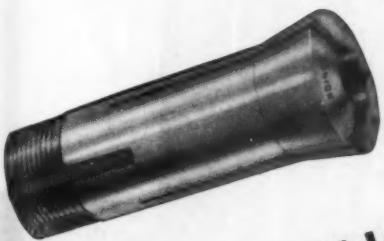
Style "B" Master Feed Fingers and Pads

HARDINGE Precision Collets and Feed Fingers for all makes of Automatics, Turret Lathes and Chucking Machines

Style "S" Sure Grip Master Collets and Pads



HARDINGE
ELMIRA, N.Y.

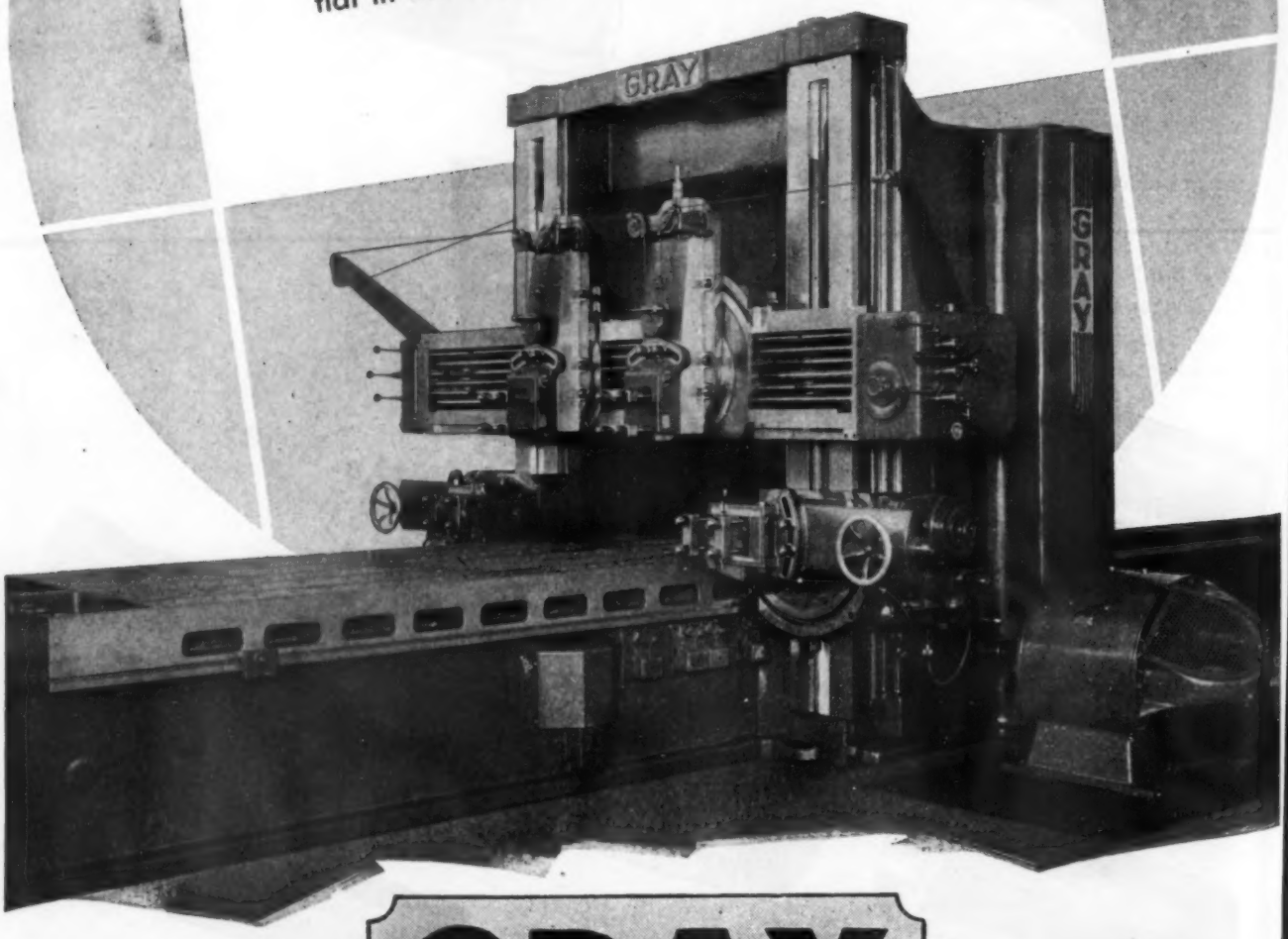


HARDINGE Precision Collets for all makes of Lathes and Milling Machines

"PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE"

WITHOUT MOVING...

● The operator clamps the rail to both housings without moving from his normal working position. The clamp is balanced and adjustment is entirely automatic (a patented Gray feature). This time saving feature not only helps maintain maximum production today but is a cost factor which will become more essential in the days to come.



GRAY

THE G. A. GRAY COMPANY
Cincinnati 7 Ohio, U. S. A.

THE GRAY LINE — Double Housing and Openside Planers, Switch Planers, Die Block Planers, Double-Housing and Openside Milling Planers, Planer Type Milling Machines, Horizontal Boring Machines.

PORTRAIT OF A HERO
...handle with care!

Many a wounded hero will come home well and strong again, thanks to a thin sheet of film...

Thanks to the miracle of the X-Ray . . .

And thanks to air conditioning and refrigeration which help make the miracle possible! *Air conditioning* supplies clean, filtered air — with accurate regulation of both temperature and humidity — in plants where X-Ray film is made, in army hospitals where it is used. *Refrigeration* cools the solutions used in processing the film.

Out of such wartime applications, General Electric is evolving new techniques, finer equipment for conditioning temperature and humidity. When equipment again is available for peacetime commercial and industrial uses, it will be vastly improved — more compact, more efficient, more flexible than ever before!

Now . . . we'll be glad to put your name down for *earliest available* data on postwar air conditioning and refrigeration equipment. Write: *General Electric Co., Air Conditioning and Commercial Refrigeration Divisions, Section 426, Bloomfield, N. J.*

☆ BUY WAR BONDS ☆

Air Conditioning by

GENERAL ELECTRIC

...the General Electric Radio Programs: The "G-E ALL-GIRL ORCHESTRA," Sundays 10 P. M., EWT, NBC..."THE WORLD TODAY" News, Every Weekday, 6:45 P. M., EWT, CBS

...for topmost precision gaging

SCHERR OPTI-FLAT GLASS SURFACE PLATES

Checking height measurement with gage blocks, indicator and height gage on a Scherr Opti-Flat Surface Plate. Scherr Sodium Light facilitates critical inspection, relieves eye-strain and provides proper light waves for surface checking with optical flats.

GUARANTEED OPTICALLY FLAT TO .00005"

This new toolroom advancement provides the means of establishing *at the start* the extreme precision standards which must be set in the measuring of tools, gages, jigs, etc., to assure today's uniform production accuracy. It puts surface plates in the same precision category as gage blocks, micrometers and other ground and lapped fine measuring tools which must be far more accurate than specified work tolerances.

Scherr Opti-Flat Surface Plates, checked with optical flats, show undeviating flatness over every part of their working surfaces. Flatness is guaranteed within 50 millionths inch. They are made of heavy, non-warping Pyrex-Brand optical glass, ground optically flat. The surface is extremely hard and difficult to scratch but even if scratched, accuracy is not impaired because no burrs are raised. Furthermore the heavy block of glass is almost immune to damage should tools or blocks strike the surface.

Other superior advantages of Scherr Opti-Flat Surface plates include:

. . . a very low coefficient of expansion making them practically non-susceptible to temperature changes — no wringing when used with gage blocks, hence no delays — protection against shock or dust by mounting in heavy hard-wood case with cover — glass is thoroughly annealed and seasoned to remove all strains and prevent warping and then ground and lapped.

Made to laboratory precision, Scherr Opti-Flat Surface Plates are a practical working toolroom essential of wide utility.

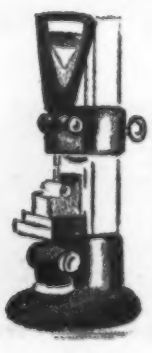
SEND YOUR ORDER TODAY

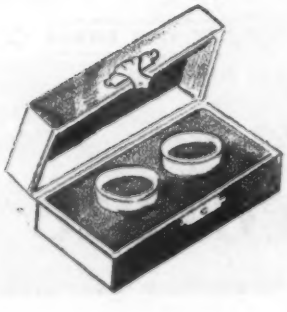
12" dia. 2" thick .00005" accuracy. Price.....$58.00
16" dia. 3" thick .00005" accuracy. Price..... 88.00

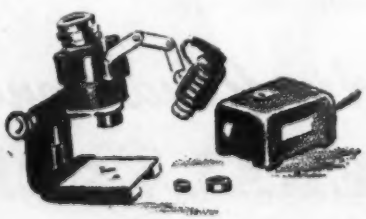
GEORGE SCHERR CO.

INCORPORATED

200 LAFAYETTE STREET, NEW YORK 12, N.Y.







PRECISION PRODUCTION

with Average Operators

Despite today's shortage of skilled labor you can obtain precision production with HILL "Open Side" Hydraulic Surface Grinders. The operator shown here is grinding gun bolts on a HILL 18"x 18"x 60" Vertical Spindle Surface Grinder. The parts are held in place on the work table by a HILL magnetic chuck.

Simplicity of operation and *permanent accuracy* are the two outstanding features of *all* HILL Grinders.

HILL "Open Side" Vertical Spindle Heavy Duty Grinders are built in table widths of 18", 24", 30". Standard table lengths range from five to twenty feet.

ALSO BUILT IN HORIZONTAL SPINDLE DESIGN

The

HILL ACME CO.

6400 BREAKWATER AVE. · CLEVELAND 2, OHIO

THIS WHEEL SUCCEEDED ...WHERE TWENTY-ONE COMPETITORS Failed!

THIS 7 x ½ x 1¼ MID-WEST SUPER-CUT wheel (2.100 IY6) tackled a grinding job 21 competing wheels failed to perform—and *exceeded* every specified requirement.

The job, called by our service engineer "the toughest grinding operation I've ever witnessed," involves removing between .010 and .011 inches of stock from each side of the inner slot of a counter weight forged from A-417 steel and having a Rockwell hardness of 58 "C" scale. The wheel, must operate from within a circle of counter weights chucked on an internal grinder. The slots, 3 inches long, .508 inch wide and 1½ inches deep, must be finished to not more than 20 micro-inches root mean square and free from all signs of burn!

Twenty-one competing wheels were submitted for pre-production trials. All of them loaded, glazed and heated the work. None of them would remove more than .002 stock.

THEN A MID-WEST SUPER-CUT (2.100 IY6) TURNED THE TRICK, REMOVING THE REQUIRED STOCK IN APPROXIMATELY TWO MINUTES OF GRINDING TIME, LEAVING A SURFACE FINISH OF BETWEEN 9 AND 10 R. M. S. AND SIDE WALLS PARALLELED TO WITHIN .0003 INCH! THE WHEEL SHOWED NO SIGN OF LOAD, ITS RADIUS AS SHARP AS AT THE START AND THE WORK'S TEMPERATURE HAD NOT BEEN INCREASED.

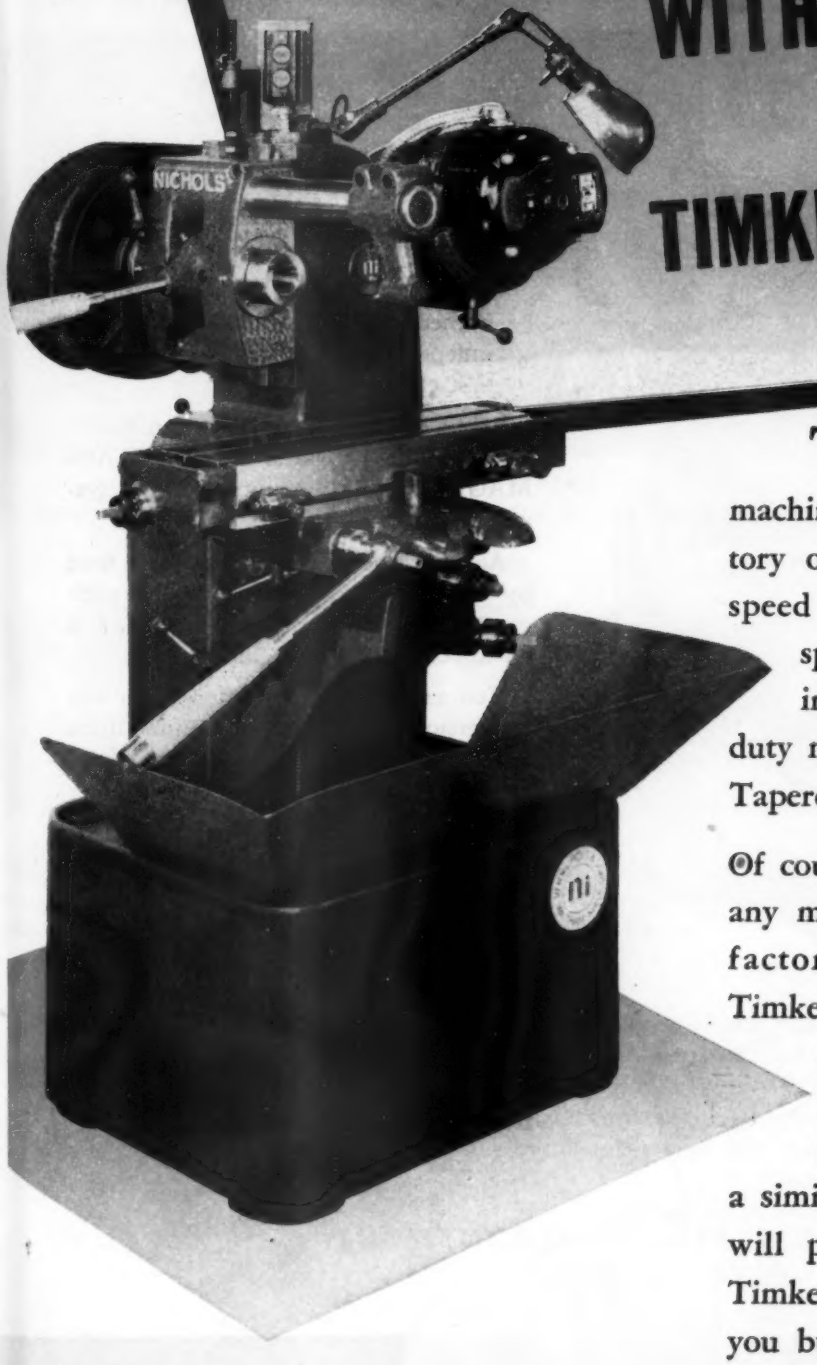
Naturally the production superintendent of that important war plant specified MID-WEST SUPER-CUT wheels for the counter weight grinding job. It will pay you to specify MID-WEST SUPER-CUT for grinding all hardened or unhardened alloy or high speed steels. Ask for a demonstration of MID-WEST superiority.

MID-WEST ABRASIVE COMPANY

Manufacturers of DEPENDABLE Abrasives

1960 E. Milwaukee Ave. Detroit 11, Mich.

SPINDLE RUN-OUT HELD WITHIN .00015" WITH TIMKEN BEARINGS



Latest model Nichols Miller, manufactured by W. H. Nichols and Sons, of Waltham, Mass. Spindle mounted on Timken Bearings.

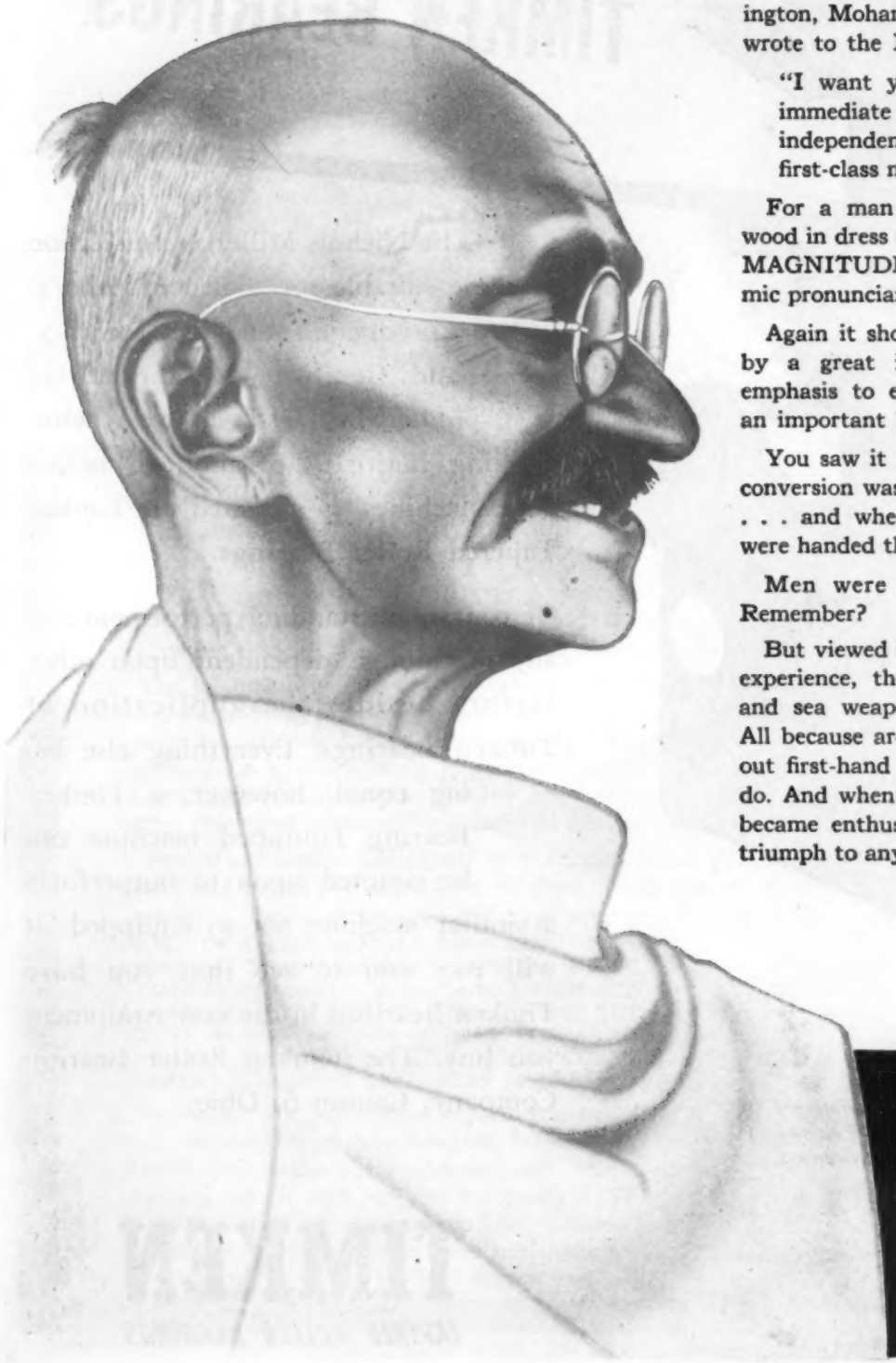
The Nichols Miller is a precision machine suitable for toolroom, laboratory or production line. Its accuracy, speed and flexibility center in the spindle which, as in an overwhelming majority of modern heavy duty machines, is mounted on Timken Tapered Roller Bearings.

Of course, outstanding performance in any machine is dependent upon other factors besides the application of Timken Bearings. Everything else being equal, however, a Timken Bearing Equipped machine can be counted upon to outperform a similar machine not so equipped. It will pay you to see that you have Timken Bearings in the new equipment you buy. The Timken Roller Bearing Company, Canton 6, Ohio.

TIMKEN
TRADE-MARK REG. U. S. PAT. OFF.
TAPERED ROLLER BEARINGS

Then he said to himself

"A War Measure of First-Class Magnitude"



WHEN the standing of India was occupying the attention of Washington, Mohandas Karamchand Gandhi wrote to the India League of America:

> "I want you to look upon the immediate recognition of India's independence as a war measure of first-class magnitude."

For a man so definitely non-Hollywood in dress or words "FIRST-CLASS MAGNITUDE" amounts to a cataclysmic pronunciamento.

Again it shows that one who is fired by a great idea automatically adds emphasis to enthusiasm! And *that* is an important business measure.

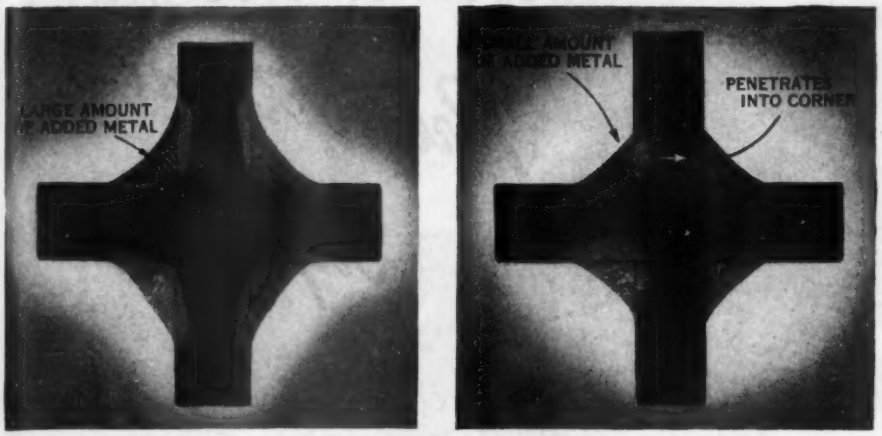
You saw it well illustrated when war conversion was hurled at manufacturers . . . and when "impossible" schedules were handed them.

Men were far from enthusiastic. Remember?

But viewed in the light of subsequent experience, those quotas for air, land and sea weapons today seem modest. All because aroused men quickly found out first-hand what Arc Welding could do. And when it did the job well, they became enthusiastic . . . which brings triumph to any front.

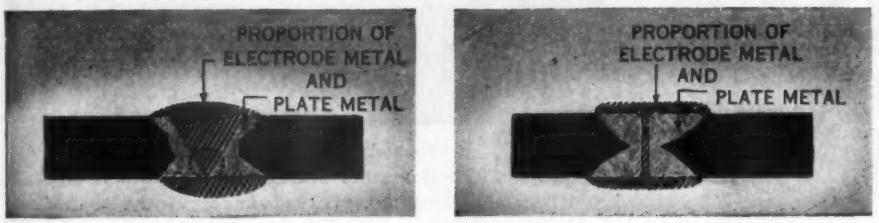
"A War Measure of First-Class Magnitude"...*he says*

CONVENTIONAL WELDING | **"FLEET-WELDING"**



TYPICAL FILLET WELDS

STRENGTH:	**Stronger than plate**	**STRENGTH:**	**Stronger than plate**
SPEED:	**5" per min.**	**SPEED:**	**12" per min.**
COST:	**100%**	**COST:**	**42%**



TYPICAL BUTT WELDS

STRENGTH:	**Stronger than plate**	**STRENGTH:**	**Stronger than plate**
SPEED:	**2" per min.**	**SPEED:**	**9" per min.**
COST:	**100%**	**COST:**	**25%**

LOOK, MAHATMA: While you pondered on the magnitude of political measures for winning, Lincoln Engineers were enthusiastically working out a very practical measure that is away out in front in magnitude:

"FLEET-WELDING"

A First-Class Production Measure ... of First-Class Magnitude

This new, revolutionary technique using "ARC-FORCE" to speed the welding of all types of joints in plate, shapes and sheet is bringing back reports of 25% to 75% faster welding . . . also savings in electrode material and power. Cases also are reported where back-chipping and plate beveling are eliminated.

The savings shown at left are typical of this new technique developed by Lincoln engineers.

A Lincoln engineer is available nearby to help you apply "Fleet-Welding" Technique. Write for Bulletin No. 440 which gives complete explanation of the simple technique and the welding procedures.

THE LINCOLN ELECTRIC COMPANY
CLEVELAND, OHIO

America's greatest natural **recourse**

ARC WELDING

In this horizontal boring operation, the Focalaire unit provides supplementary lighting on the critical work area without throwing glare in the operator's eyes.

Proportional lighting is the right combination of general and supplementary lighting necessary for quick, accurate vision at critical work areas. For supplementary lighting, Westinghouse offers a complete new line of Focalaire units for easy, quick installation on machines, assembly benches and worktables. Correctly installed, Westinghouse Focalaires—

Save Eyes . . . Stop Squinting . . . because each worker sees quickly and easily the things he must to do his job well and in comfort.

Improve and Increase Production . . . because workers adhere more closely to "specs" . . . and perform their job with confidence and precision.

Cut Production Costs . . . because proper lighting reduces rejects, cuts inspection time, increases production and prevents accidents.

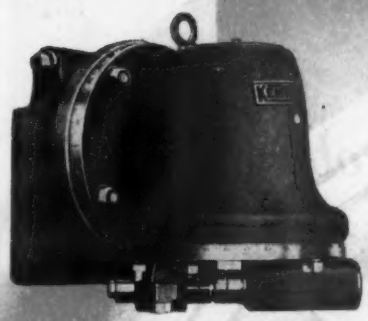
Six standard Focalaire units are now available from your Westinghouse Lighting Distributor. Or, for more information, write for B-3310. Westinghouse Electric & Mfg. Co., Dept. 7-N, East Pittsburgh, Pa. J-04003

Westinghouse

PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

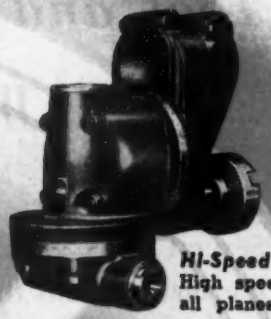
Lighting Equipment

Keep Wheels of Industry Rolling with KEMPSMITH *Standard* ATTACHMENTS



Heavy Duty Universal
Heavy duty angular milling in all planes. (Bulletin No. 104)

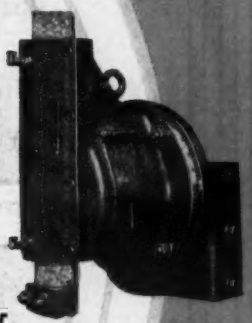
Circular Table
Milling circles or cams, gear cutting, high-speed continuous milling, etc. (Bulletin No. 108)



Hi-Speed Universal
High speed angular milling in all planes. (Bulletin No. 113)

Vertical Head
Converts horizontal to vertical machine, retaining identical spindle characteristics. (Bulletin No. 105)

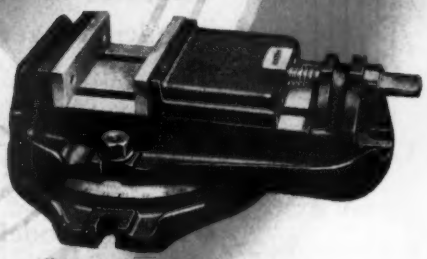
BROADEN THE SCOPE OF YOUR MILLING MACHINES



Slotter
Keyseating, broaching, general slotting, tool and die making, etc. (Bulletin No. 107)

Arbors and Accessories
A full range for standardized spindles carried in stock. (Bulletin No. 116)

Dividing Head
Precision indexing. Spiral cutting mechanism and chuck also available. Bulletin 119.



Vises
Standard and Heavy-Duty, plain and swivel types. Adaptable to special jaws to save fixtures. (Bulletin 117)

Convert your general duty milling machine to a special purpose miller by utilizing Kempsmith Standard Attachments.

It's really surprising, the great variety of milling operations that can be handled by Kempsmith *Standard* Attachments mounted on a standard milling machine. The same high degree of rigidity and precision characteristic of Kempsmith Milling Machines for more than 56 years is embodied in these sturdy standard attachments. Thousands are serving industry, every day, performing the most delicate and accurate operations, or handling difficult production milling jobs.

So plan now on broadening the scope of YOUR milling machines by applying Kempsmith Standard Attachments. Write for bulletins designated above.

THE KEMPSMITH MACHINE CO. • Milwaukee 14, Wis., U. S. A.

KEMPSMITH

• Precision Built Milling Machines Since 1888 •

An Open Letter and Invitation to

Tool and Die Makers Who Have Shop Problems

- Several years ago Kearney & Trecker began helping tool and die makers with their shop problems whenever they'd write in asking as to the best method of producing a particular tool or die. These requests for help included the making of plastic molds — forging, die casting, stamping, and drawing dies. In fact, they covered the whole tool and die field.

- In many cases our Model D Rotary Head Miller would handle the job to perfection — in other instances, after looking at the blueprints, we'd recommend some other method of producing the tool or die that was troubling them.

- Because of the extreme pressure which all of us were working under at that time, we didn't publicize the fact that such service was available. BUT . . . now we have set up facilities in our Tool and Die Department which will enable us to give you *prompt* advice without obligation, as to the fastest, cheapest way to do the job.

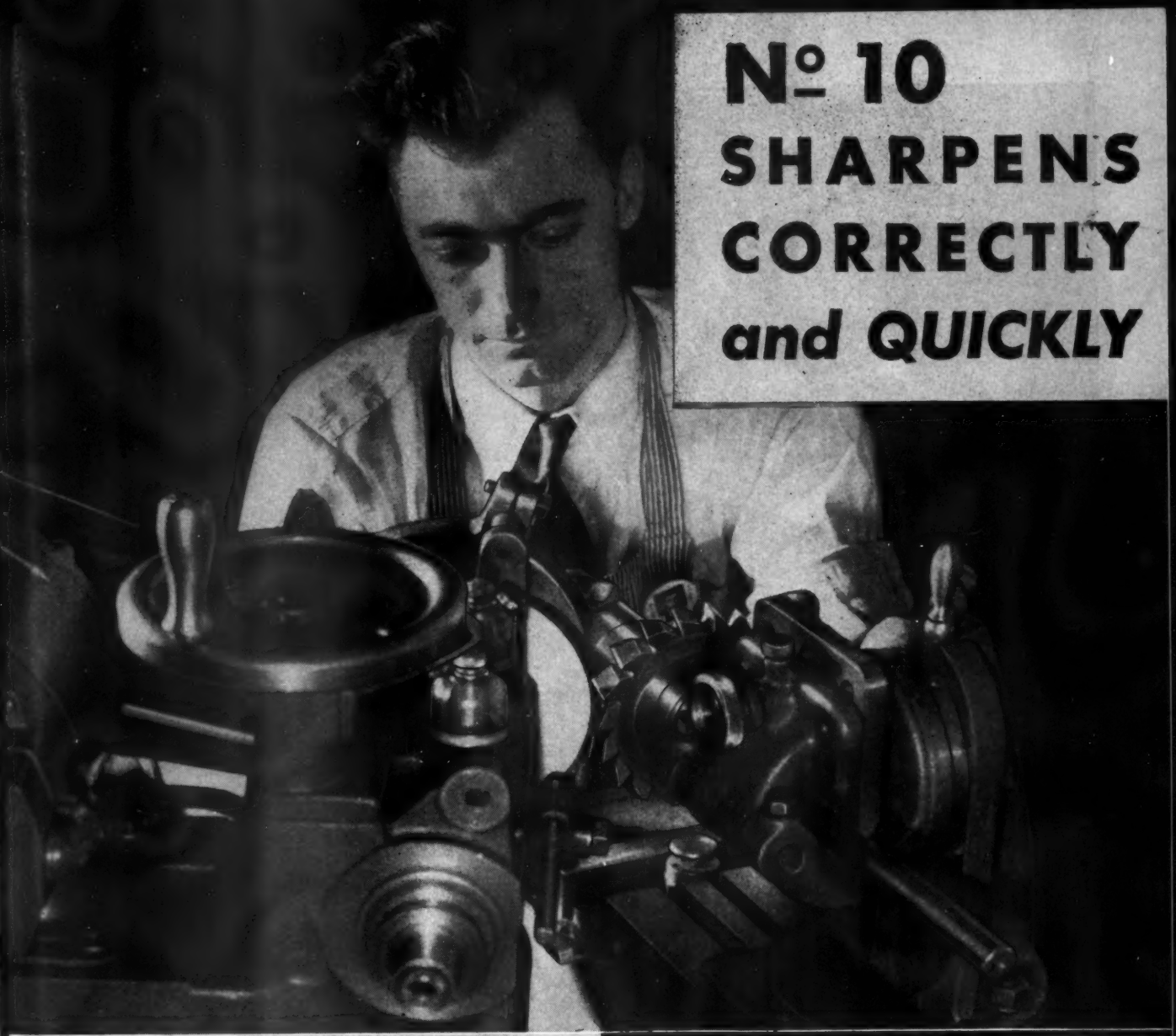
- If our Model D Rotary Head Miller is, in our judgment, the best bet for producing it — we'll tell you. In fact, we'll even make the job for you at a *very nominal cost* here in our own Tool and Die Department. What's more, we'd welcome having one of your men come to the plant to watch us make it.

- *If,* on the other hand, we feel that there's a better method of producing the tool or die — we'll return your blueprints with our recommendations. Fair enough?

If you're interested — write Tool and Die Division, Kearney & Trecker Products Corp., Milwaukee 14, Wis.

Kearney & Trecker Products
CORPORATION

No. 10 SHARPENS CORRECTLY and QUICKLY



PROMPT DELIVERY on No. 10 enables you to install the machine now — so as to get immediate advantage of its usefulness.

BROWN & SHARPE MFG. CO.
PROVIDENCE 1, R. I., U. S. A.

Precision Sharpening of milling cutters and tools is performed efficiently on the No. 10 Cutter and Tool Grinding Machine . . . a dependable Machine built for the job of making cutting tools serve longer . . . and better.

- **Low fixed height of Machine gives good visibility of wheel and work**
- **Sensitive controls - easily operated**
- **Designed for front operation on all types of work**

BROWN & SHARPE

For Hitting the "Pinpoint" from Five Miles Upstairs

Microhoning Provides Vital

High altitude bomb sights need a certain number of bearing surfaces of almost perfect precision accuracy and surface finish. The amazing accuracy of our bomb sights depends on this near-perfect accomplishment.

The thousands of these bomb sights needed made it necessary to achieve this fine instrument precision at production speed.

Ordinary machining practice can't produce such results—and fine instrument methods just aren't fast enough.

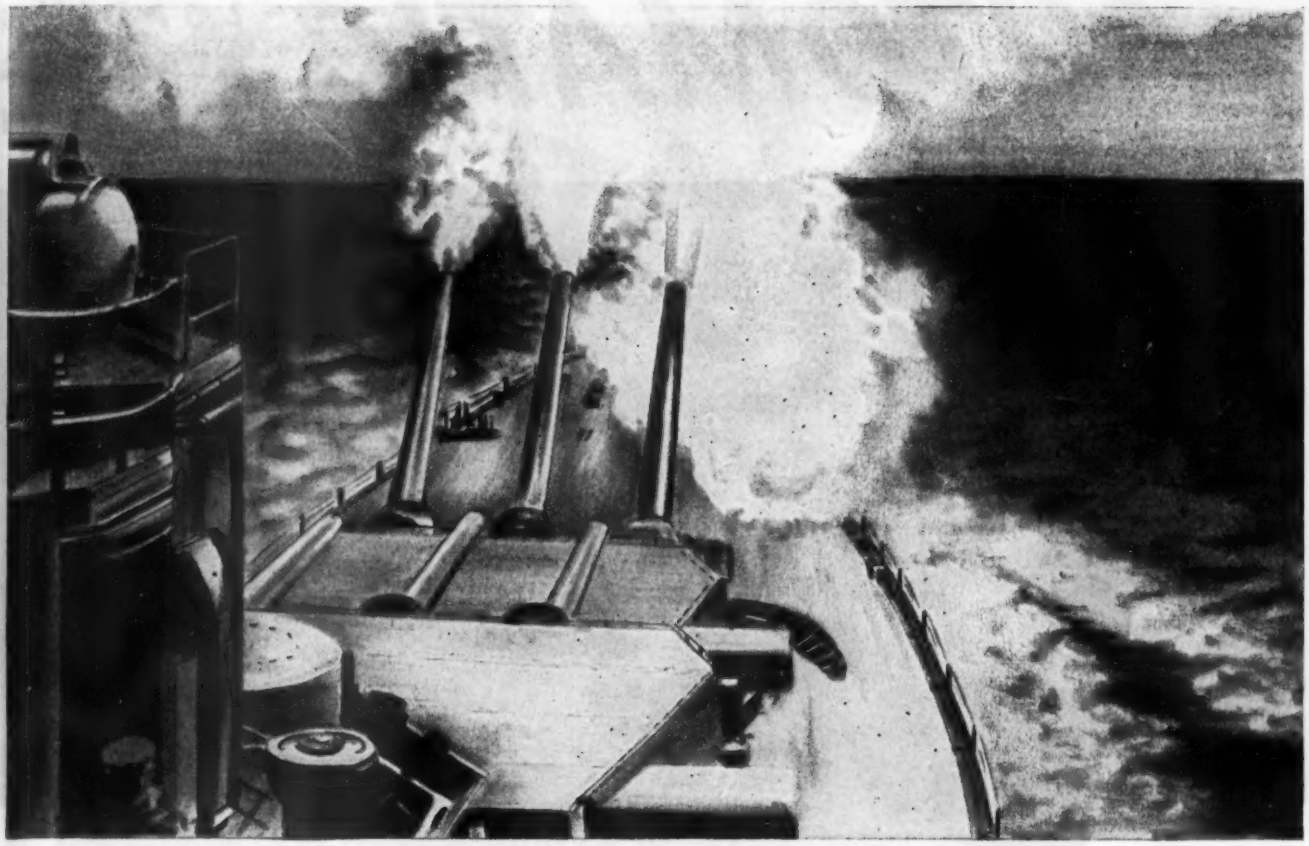
Microhoning bridged the gap. By means of this highly controlled abrading process, the extreme precision needed was obtained at production rates.

This modern final machining process will generate dimensional accuracy to "tenths" and fractions of "tenths", and provide any desired surface finish. It is applicable to the bores of these bomb sight bearings as it is to highly loaded gun turret bearings.

Precision Microfinish Honing will make many important contributions in postwar processing and Micromatic engineers will be ready with many new honing developments.

MICROMATIC
HONE CORPORATION
DETROIT 4, MICHIGAN

MAKERS OF HONING MACHINE TOOLS



. . . or Blasting a "Tin Can" Beyond The Horizon

Precision Bearings in Wartime Production

A battleship gun turret is a complex precision instrument on a gigantic scale. Each complete turret weighs about 1550 tons—as much as an entire medium weight destroyer. This great mass must not only move smoothly, but also very rapidly—guns must be quickly targeted with extreme precision and without backlash. That calls for something extraordinary in the way of bearings.

They must be dependable and have amazing accuracy. Inaccuracy or the slightest imperfection of operating fit would destroy the telescope precision needed to make each shot count.

The best ordinary machining methods won't provide the precision nor the fine surface finish necessary for accurate frictionless operation.

Microhoning was found to be the answer. Microhoning is a process of final machining which generates average bore accuracy for roundness and straightness within .0002" to .0003"—which removes up to 65 cubic inches of stock per hour. In production of turret bearings—not only for battleships, but also for cruisers and destroyers—Microhoning has provided the desired combined precision and finish.

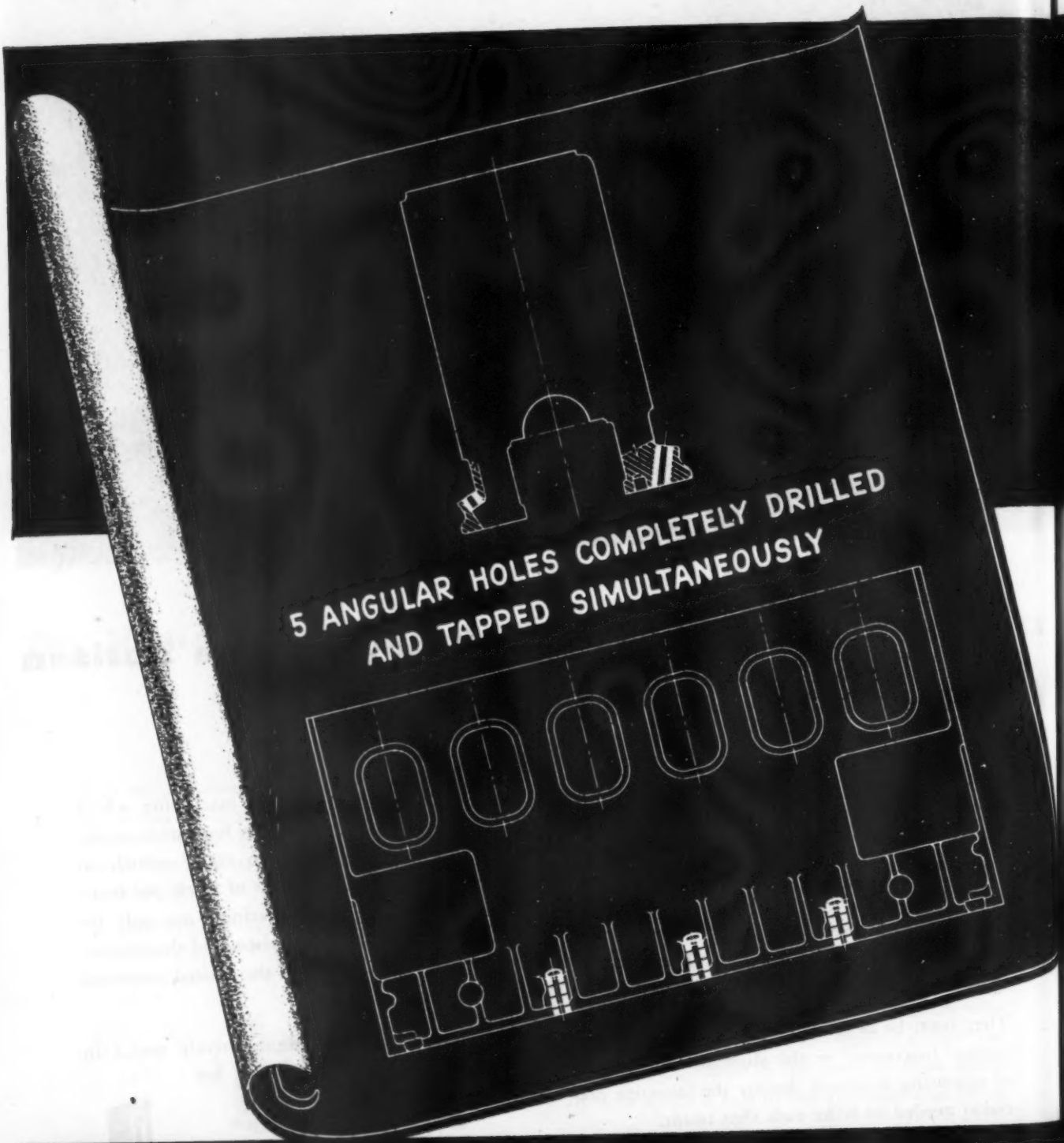
And, it will be more constructively useful in coming times of peace than it has been in war production.

MICROMATIC
HONE CORPORATION
DETROIT 4, MICHIGAN

MAKERS OF HONING MACHINE TOOLS

AUTOMATIC

LOADING
CLAMPING
EJECTION

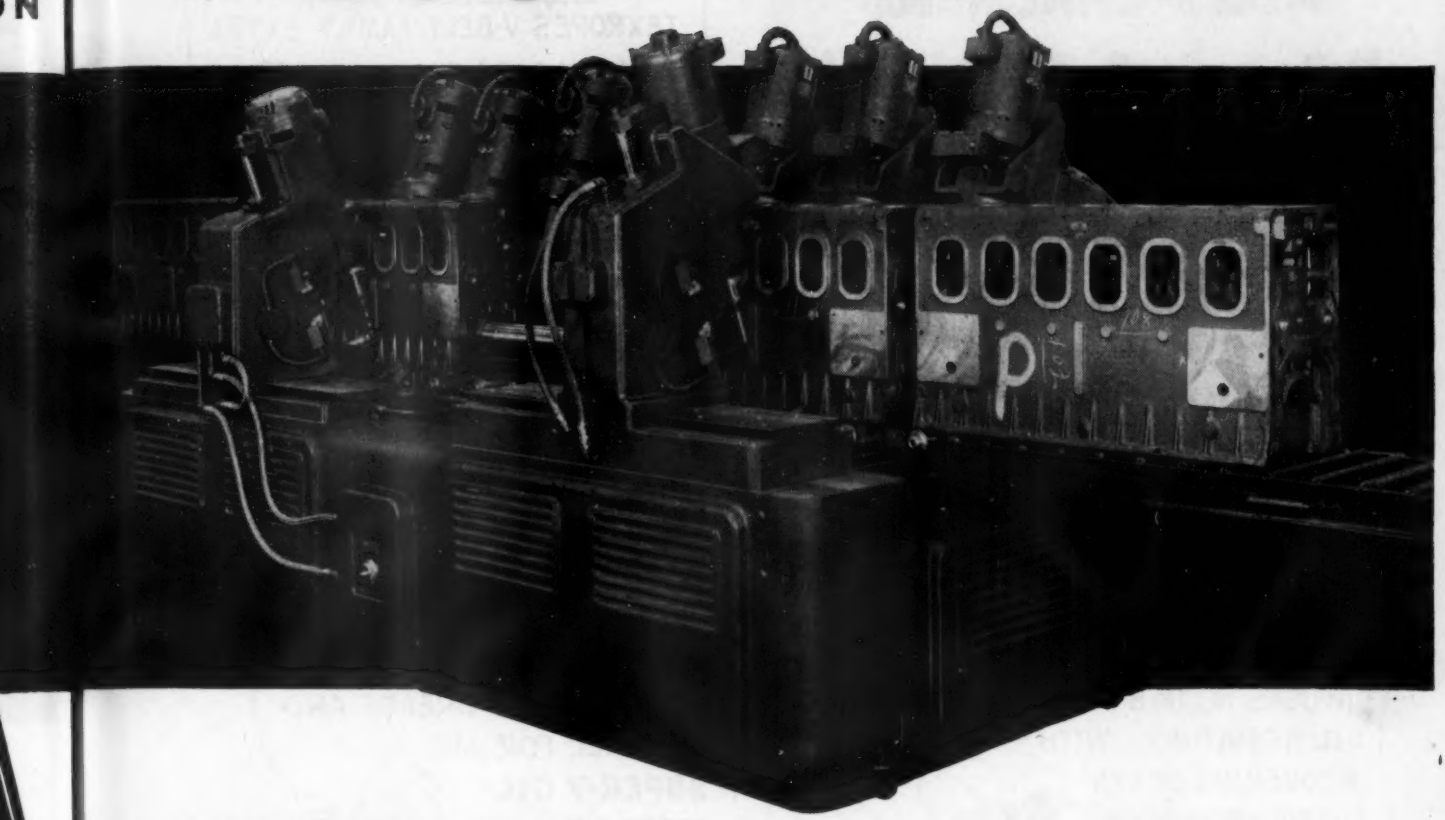


MACHINE TOOLS

CROSS

New York • Detroit • Chicago

PLUS 45 PIECES PER HOUR DRILLED AND TAPPED



● **AUTOMATIC**—Yes, because the cylinder blocks are transferred from station to station, and drilled and tapped without operator attention.

● **PLUS**—because, in addition, feeding, locating, clamping and ejection of the work are accomplished automatically at the push of a button.

CROSS ENGINEERS designed and built this *special machine* to drill and tap five angular holes in a Diesel engine cylinder block. The results typify the principle behind every Cross *Special Machine*—high-speed, automatic removal of metal on equipment anyone can operate.

In this case, 45 blocks per hour are drilled and tapped at 80% efficiency, the work being moved from station to station and machined without any attention from the operator. But more than that, the work is fed, clamped, unclamped and ejected automatically, too. All motions are mechanically and hydraulically actuated, electrically synchronized and controlled. Inexperienced or unskilled operators maintain accurate tolerances and obtain large-volume production from a machine that occupies comparatively little floor space.

Thus Cross engineering produces a *special machine* to combine difficult drilling and tapping operations and perform them at high speed at the push of a button—a principle Cross can apply to your many metal-removing problems.

Cross Engineers are prepared to help lower your costs and assist with your manpower difficulties by designing, building and installing special machinery in your factory and showing your workmen how to operate it.

A new Cross Catalog contains 35 detailed case histories of successful Cross *Special Machines.* For your copy, write on your letterhead to The Cross Company, Detroit 7, Michigan, Department 51.

Special Machines •

S-11

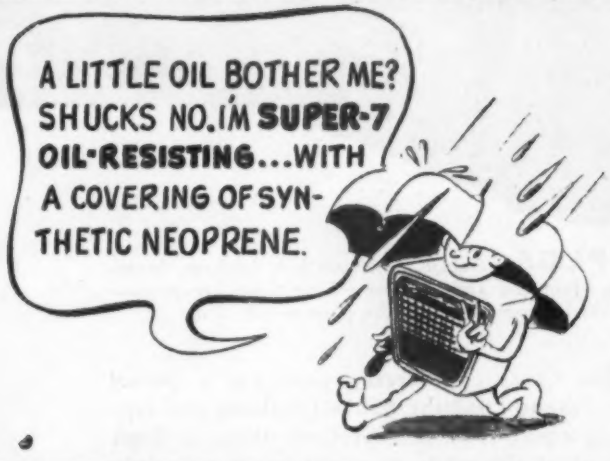
for automatically performing any one or a combination of metal cutting operations

TURNING · MILLING · DRILLING · BORING · REAMING · TAPPING · GRINDING

INTRODUCING ALLIS-CHALMERS' New V-Belt Family!

To lick every one of your different belt problems, you can be sure of finding the right belt in America's newest and widest V-belt line... Allis-Chalmers' Texrope!

I'M SUPER-7-STEEL--NEWEST AND STRONGEST MEMBER OF TEXROPE'S V-BELT FAMILY. EXTRA-HEAVY LOADS, FIXED CENTER DISTANCES ARE WHERE I SHINE.



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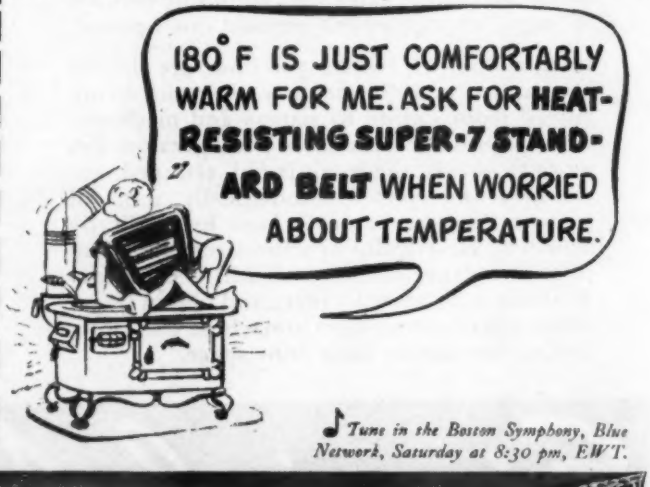
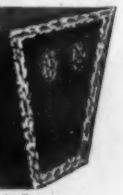


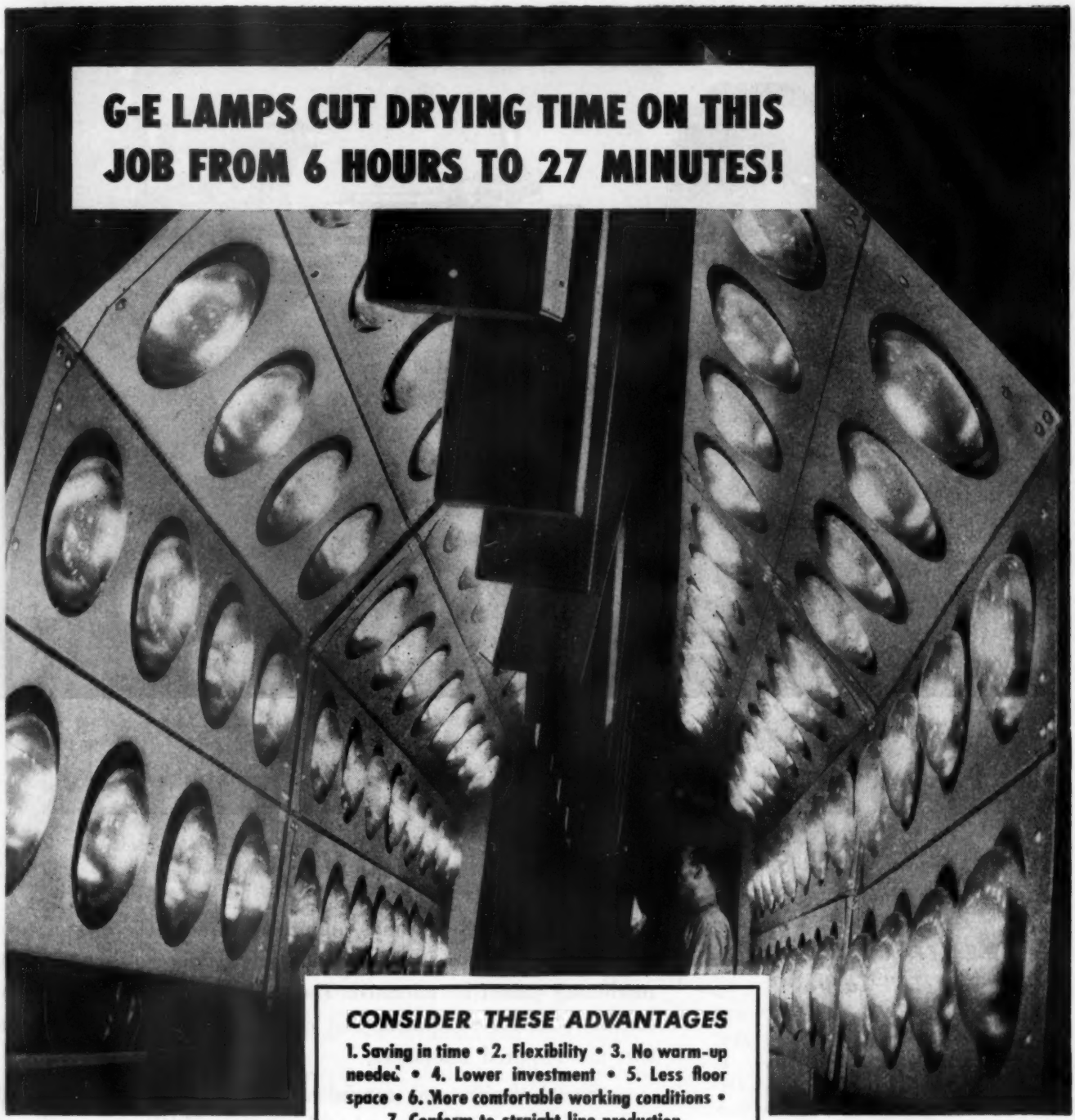
♩ *Tune in the Boston Symphony, Blue Network, Saturday at 8:30 pm, E.W.T.*

IT PAYS TO MAKE ALLIS-CHALMERS YOUR V-BELT DRIVE HEADQUARTERS



Texrope Super-7 V-Belts result from the cooperative research of two great companies—Allis-Chalmers and B. F. Goodrich—and are sold exclusively by A-C.

G-E LAMPS CUT DRYING TIME ON THIS JOB FROM 6 HOURS TO 27 MINUTES!



CONSIDER THESE ADVANTAGES

1. Saving in time • 2. Flexibility • 3. No warm-up needed • 4. Lower investment • 5. Less floor space • 6. More comfortable working conditions • 7. Conform to straight line production.

INSTRUCTIONS issued by the headquarters of a large company called for use of conventional ovens to dry paint on aircraft instruments. Drying time was six hours —two hours per coat.

Production man in one of the company's plants decided to use a drying tunnel with General Electric Drying Lamps. He reduced drying time to 27 minutes—nine minutes per coat!

Exceptional? No! Radiant energy from G-E Drying Lamps is speeding production, cutting costs and saving manpower in hundreds of plants. For further information, get in touch with your nearest G-E Lamp Office or write General Electric, Div. 166 AC-G20, Nela Park, Cleveland, O.

WHAT PART OF THE SUN DO YOU WANT?

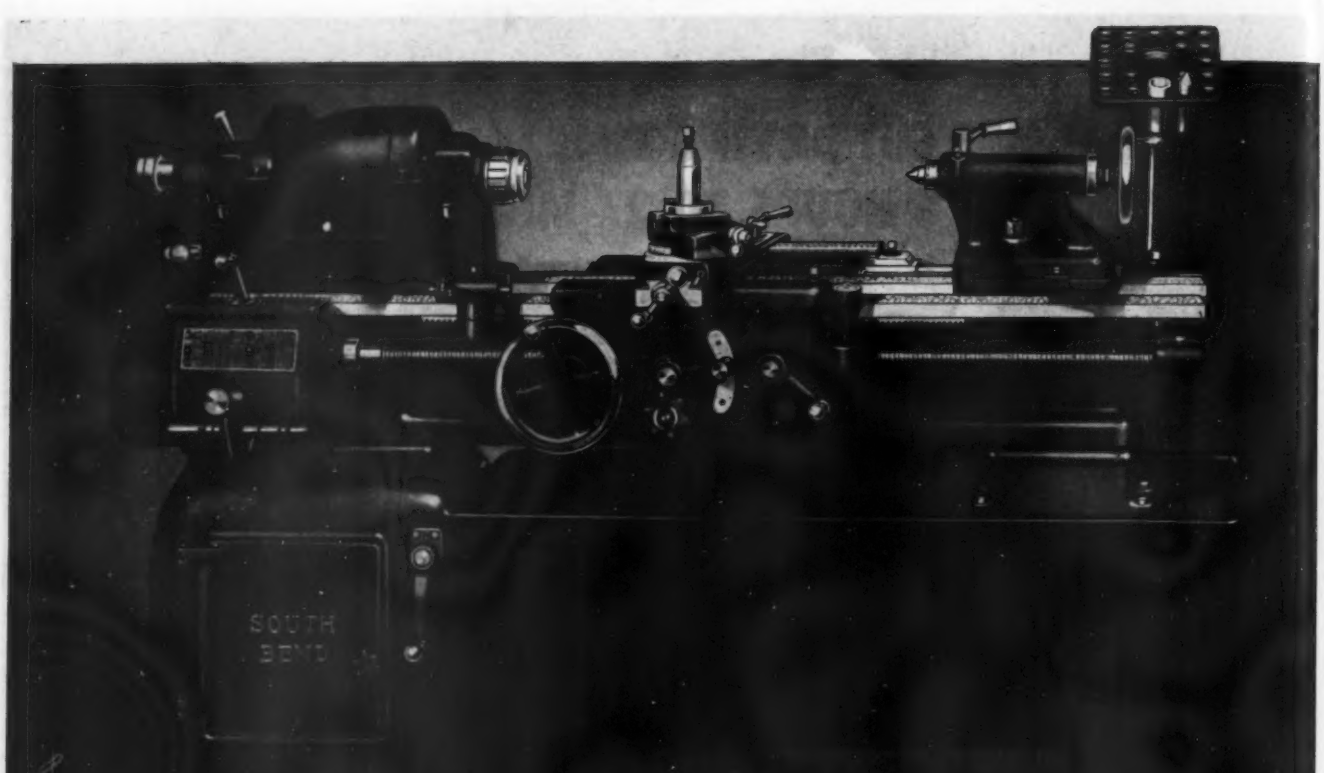
"MOVING THE SUN INDOORS" is the constant aim of G-E Lamp Research. G-E lamps bring industry the benefits of the sun, from the infra-red lamps for heat, through filament, mercury and fluorescent lamps for light, to ultra-violet lamps for health.

Keep Buying War Bonds—Keep the War Bonds You Buy

Hear the General Electric radio programs: "The G-E All-Girl Orchestra", Sunday 10 p.m. EWT, NBC; "The World Today" news, every weekday 6:45 p.m. EWT, CBS.

G-E LAMPS

GENERAL ELECTRIC



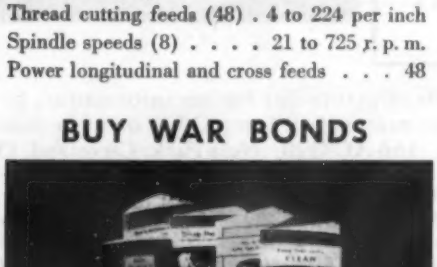
SOUTH BEND LATHES

FOR UNIFORM ACCURACY

SPECIFICATIONS of 16" lathe

Swing over bed	16¼"
Distance between centers	33½"
Maximum collet capacity	1"
Hole through spindle	1⅛"
Thread cutting feeds (48)	4 to 224 per inch
Spindle speeds (8)	21 to 725 r. p. m.
Power longitudinal and cross feeds	48

BUY WAR BONDS

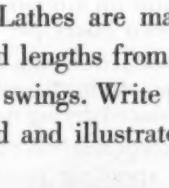


WAR PRODUCTION demands uniform accuracy. The loss of time or the waste of scarce strategic materials because of variations in machining cannot be tolerated. There is no place in our war production plan for equipment that cannot be relied upon to maintain the required tolerances.

Sound design and careful workmanship give South Bend Lathes the dependable precision that assures uniform accuracy at all times and speeds-up production on the most exacting machining operations.

South Bend Engine Lathes and Toolroom Lathes are made with 9", 10", 13", 14½", and 16" swings, with bed lengths from 3' to 12'. The Turret Lathes are made with 9" and 10" swings. Write for Catalog No. 100-C in which they are all described and illustrated.

TRAINING HELPS—Sound films, books, wall charts, and bulletins are available for training lathe operators. Write for Bulletin No. 21-C.

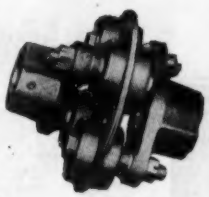


SOUTH BEND LATHE WORKS

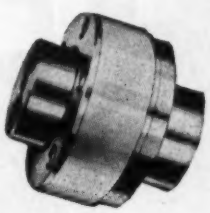
LATHE BUILDERS FOR 37 YEARS • SOUTH BEND 22, IND.

A Size and Type of COUPLING for every need... MORSE

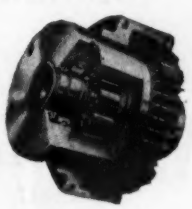
A. Morse Roller Chain Couplings distribute heavy load stress.



B. Morflex Couplings allow for maximum distortion in use.



C. Morflex Radial Couplings withstand torsional and thrust loads.



D. Free Wheeling Clutch Couplings for standby power, selective drive service.

Closely associated with the design and operation of power transmission equipment is the proper selection of Flexible Couplings. That is why Morse through its years of experience in this field has concentrated on the manufacture of a line of couplings that properly suits most kinds of service.

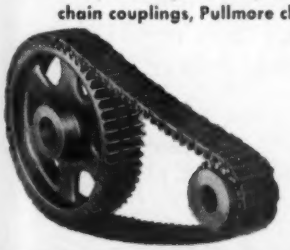
A. Morse series DRC couplings consists of only three all steel parts: two sprockets and a length of *Morse* "American Standard" Double Roller Chain. The use of double chain increases sprocket tooth bearing areas, affording greater power capacity for given over-all diameter.

B. Standard Morflex Couplings derive their flexibility from a floating center assembly to which two steel hub members are separately connected through resilient rubber trunnion blocks. This design prevents metal-to-metal contact, allows for maximum distortion without loss of efficiency.

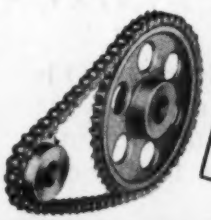
C. The Morflex Radial Coupling is constructed with a series of rubber trunnion blocks assembled on equally spaced pins extending radially from the hub member, and supported in a two piece metal housing, withstands both torsional and thrust loads.

D. Free Wheeling Clutch Coupling: A chain coupling provided with a Morse precision Free Wheeling clutch for standby power units, or selective drive service.

Other Morse precision products include silent and roller chain drives, sprockets, silent chain couplings, Pullmore clutches, automotive timing chains and marine transmissions.



Whatever your power transmission problem may be, remember that 40 years of Morse Chain experience in the design, research and manufacture of dependable power transmission equipment are available to you. Consult Morse for this service.

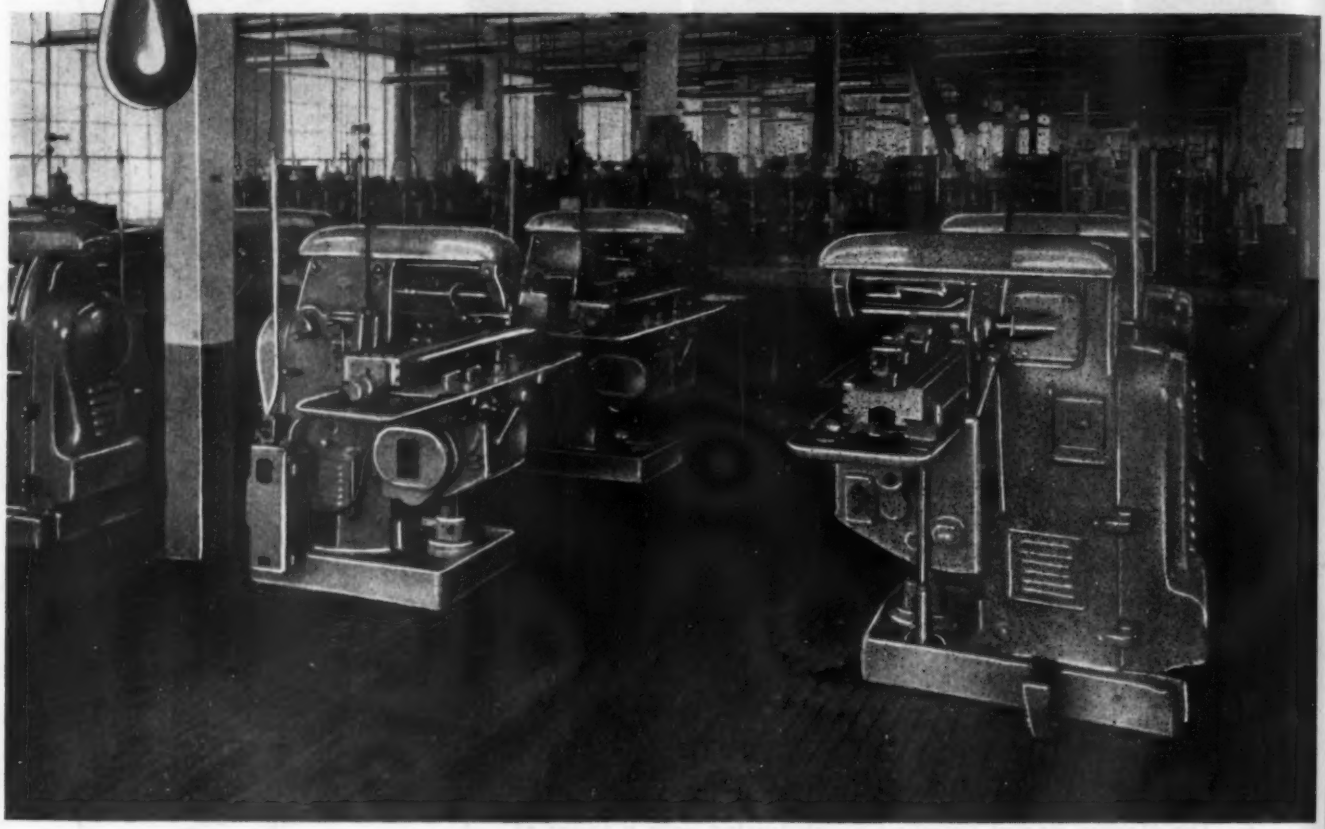


SPROCKETS CHAINS FLEXIBLE COUPLINGS CLUTCHES

MORSE Roller and Silent CHAINS

MORSE CHAIN COMPANY • ITHACA, N.Y. • DETROIT 8, MICH. • A BORG-WARNER INDUSTRY

CORRECT Lubrication means *Better Maintenance*



PROBLEM—excessive wear, difficult maintenance.

SOLUTION—*Correct* lubrication.

Sinclair provides a range of specialized oils and greases for *correct* lubrication of *MACHINING EQUIPMENT*

Sinclair General Purpose Oils permit a reduced inventory of highly efficient lubricants for automatics, turret lathes, broachers, grinders, machine tools generally.

Sinclair Cutting Oils and Coolants are widely diversified and adapted to every individual machining problem.

Let us tell you more about how Sinclair lubricants make for increased production and *better maintenance*

(Write for "The Service Factor"—published periodically and devoted to the solution of lubricating problems.)

SINCLAIR INDUSTRIAL OILS

FOR FULL INFORMATION OR LUBRICATION COUNSEL WRITE SINCLAIR REFINING COMPANY, 630 FIFTH AVENUE, NEW YORK 20, N. Y.

Union

—The Tools You Buy Again

Accuracy, tool economy and high output are the factors that make Union Tools the Tools You Buy Again for munitions production. Our research into tooth design, cutting properties of tool steels, characteristics of the newest alloys and modern machine feeds and speeds enables us to combine these factors in the most advantageous proportions in every Union Tool. Choose them for longer lasting accuracy, for higher production under today's urgent demands.

Union Twist Drill Co.
Athol, Mass.

S.W.Card
Butterfield
UNION

TWIST DRILL COMPANY

Succ

Proving their capacity for high production and exceptional accuracy on the toughest munitions jobs, Card Taps are helping American manufacturers to attain Success in the battle of production. Call on Card for advice on your unusual tapping jobs. They can tell you the correct taps to choose and how to use them for maximum efficiency in meeting the difficult assignments of munitions and aircraft manufacture.

S.W.Card
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UNION

S. W. Card Mfg. Co.
Mansfield Mass.

DIVISIONS OF THE UNION

Butterfield

TOOLS OF DISTINCTION

The invisible ingredients of distinction that go into every tool bearing the Butterfield name — skill of design, metallurgical perfection, care of manufacture —are translated into very tangible performances in busy shops throughout the nation. On many of the toughest war jobs Butterfield Tools are delivering the high productivity and unquestioned precision that are indispensable in today's crisis. Whatever the material, the type of work . . . specify Butterfield and rest assured of long, trouble-free performance!

Butterfield Division

Derby Line, Vt. *Rock Island, Que.*

S.W.Card
Butterfield
UNION

TWIST DRILL COMPANY

THESE HEAVY TOOLS PROVIDE GREATER RIGIDITY AND INCREASE THE RANGE OF

CINCINNATI ACME TURRET LATHES

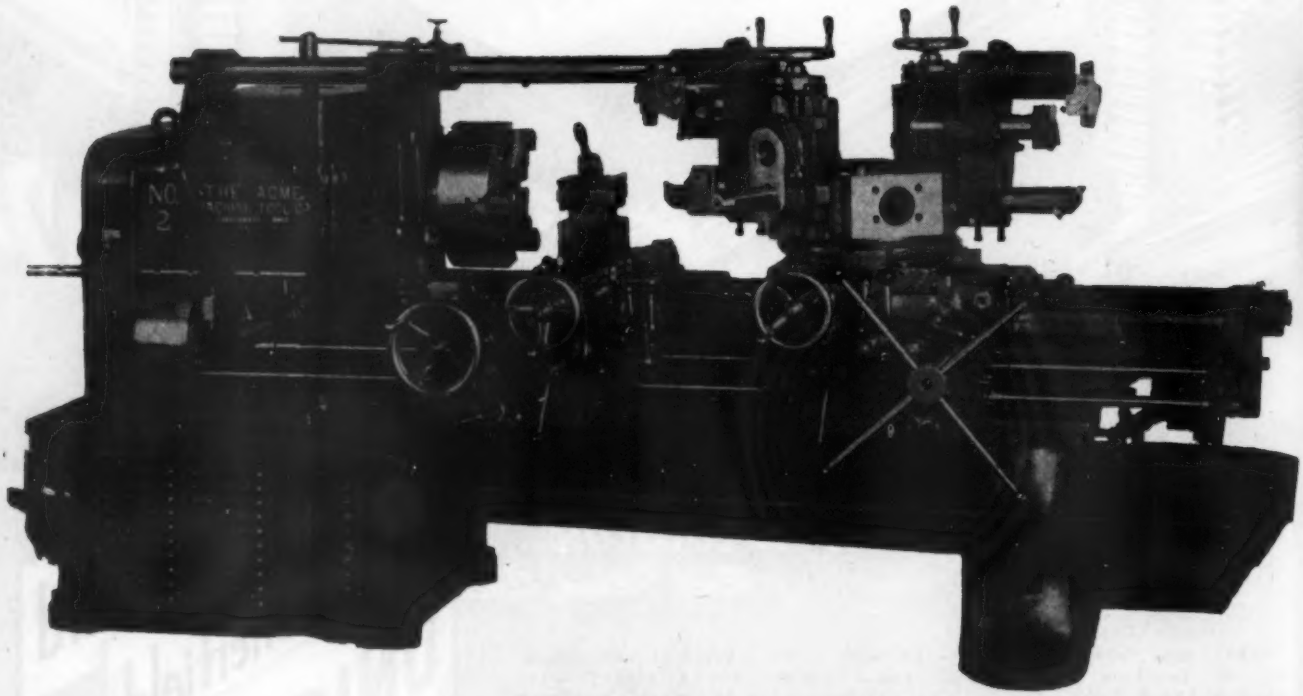
● The group of heavy tool heads and holders illustrated have been developed by Acme Machine Tool Co. to meet the current demands for power—high speed—and accuracy imposed by the increased use of carbide tools. At the left is an adjustable multiple turning head with guide bushing for taking support from the rigid heavy stationary bar mounted on the headstock.

At the extreme right is a standard heavy duty multiple turning head—non adjustable—but with fixed center holes for holding various cutter heads.

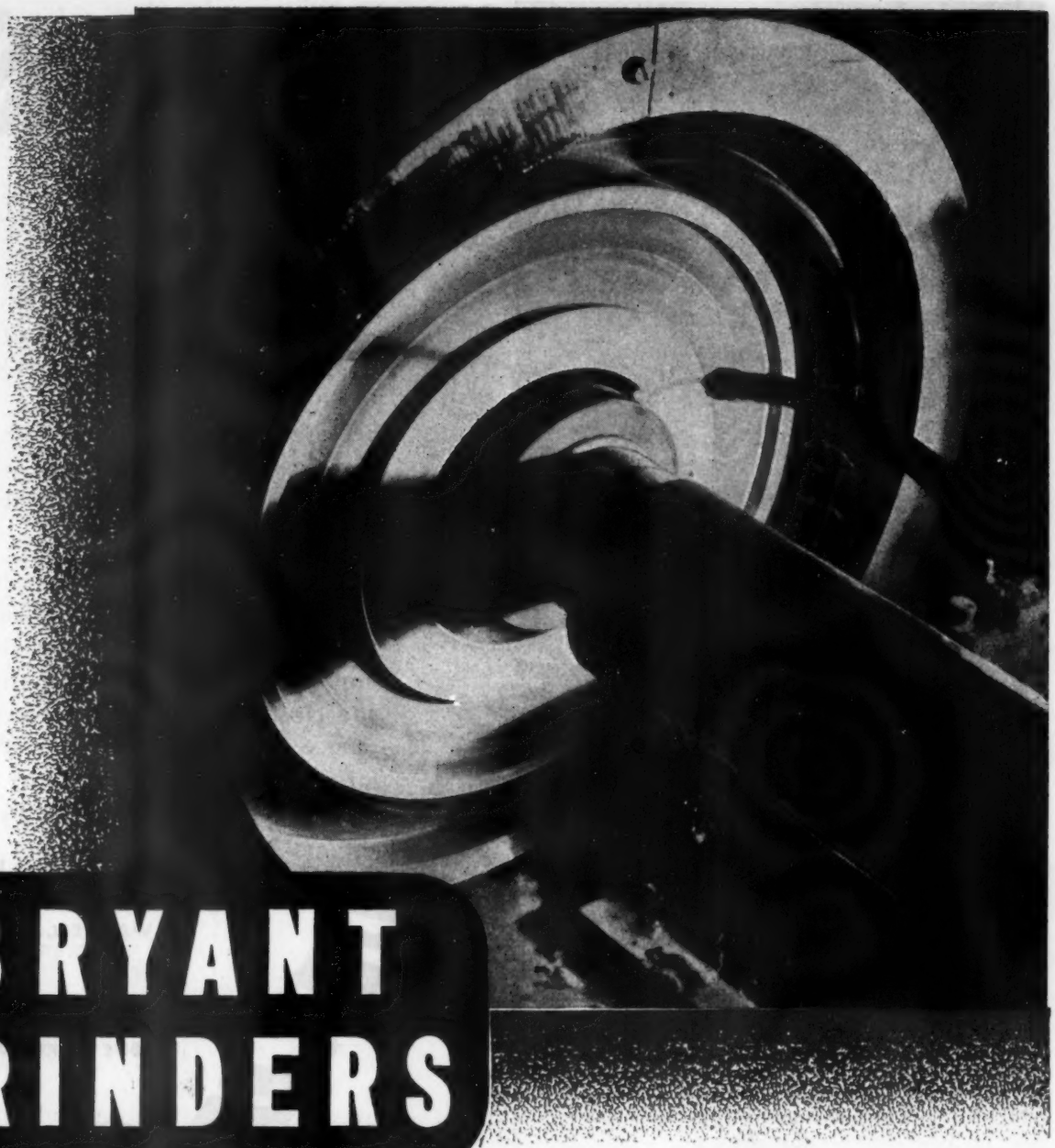
Tool holders of straight and angular, types and an adjustable type for the fixed center type head are also included in the center of the group. These are built extremely heavy throughout and accommodate cutting tools of very heavy cross sections.

Acme Turret Lathes are made in bar capacities from 2" to 4½" diameter and in chucking capacities from 20" to 28" swing.

Consut Acme Engineers on your tooling problems.



...The ACME MACHINE TOOL CO. ...CINCINNATI 32, OHIO.



BRYANT GRINDERS

Of all the machine tools in use by industry, none is more basic or more vital than the internal grinding machine.

Machine tool engineers have helped the men of government and of industry to plan the most desperate and gigantic production program of all time . . . and they can help those same men in planning today for the peace that must be won after the war is won!

One of these is a Bryant man. Send for him today!

BRYANT CHUCKING GRINDER CO.
SPRINGFIELD, VERMONT, U. S. A.

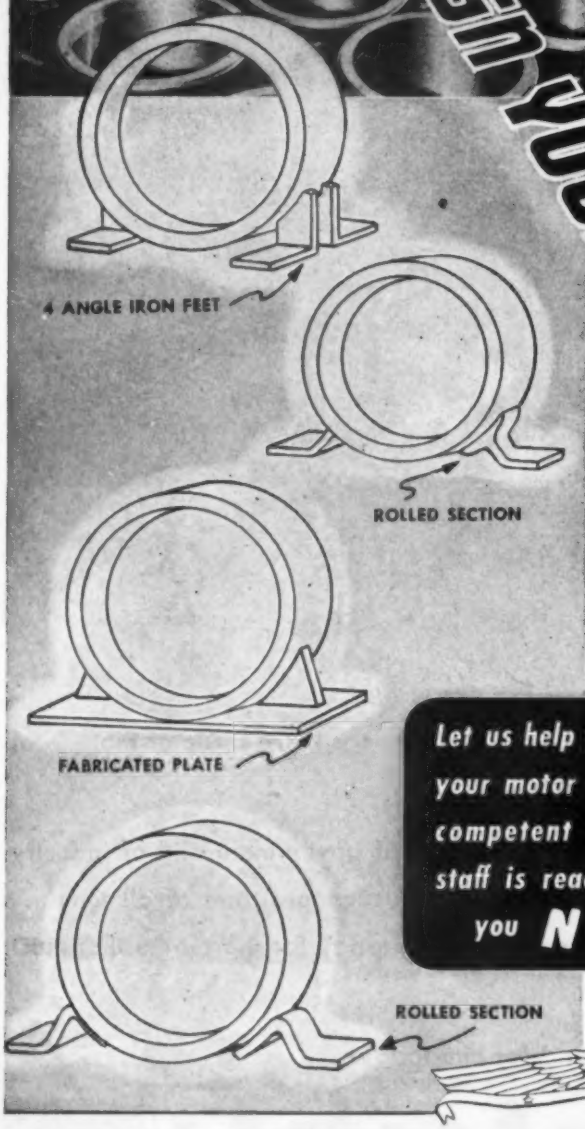
LET AMERICAN WELDING REDESIGN YOUR MOTOR FRAMES

● Many motor manufacturers have switched from cast motor frames to fabricated frames. It is important that you keep your eye on postwar applications which will necessitate further redesigning. Our experience over many years in rolled flash butt welded motor frames enables us to help you in redesigning.

American welded steel rings have all the advantages inherent in a rolled product . . . savings in weight . . . resistance to impact and shock . . . freedom from pores, and closer rough ring tolerances which reduce machining time and cost. The forge weld has no affect on the magnetic or electrical properties of the field.

THE AMERICAN WELDING & MANUFACTURING COMPANY
WARREN, OHIO

BACK THE ATTACK—
BUY MORE WAR BONDS



Let us help you redesign your motor frames. Our competent engineering staff is ready to assist you ***NOW!***

AMERICAN WELDING
WARREN, OHIO
STEEL PRODUCTS FABRICATED BY RESISTANCE. ARC OR GAS WELDING

FINISH-REAMS MORE HOLES PER MAN-MINUTE!

THE PATENTED

LEMPCO

DUAL-SPIRAL EXPANSION REAMER

Right-hand flutes on two segments spiral counter to left-hand flutes on the third blade segment simultaneously. In this way a clean opposite-spiral shearing action is effected, and a satin-smooth surface is finish-reamed in one operation. Reams precision holes in magnesium, aluminum, bronze, zinc, steel, and all machinable alloys and plastics. .035" to .080" straight line expansion. Many exclusive, patented features. Write for complete description.

WRITE FOR CATALOG

LEMPCO

5711 DUNHAM RD. • BEDFORD, OHIO, U. S. A.

POINTS GOOD FOR *150 More Pieces!*

SUNICUT

Doubles Drill Life . . . Improves Finish . . . Increases Speeds

Round, perfect holes — 300 of them per drill grind — that's the present production rate on a certain drilling operation at this large plant. But the rate wasn't always that high . . . as the following facts of the case show.

Poor finish and short drill life had been common complaints of the operators. On the SAE 4140 steel being machined, 150 pieces were the maximum they could get per drill grind . . . the finish was rough, despite the use of a well-known high grade cutting oil. Finally, they made a change in cutting oil at the suggestion of a Sun Oil Engineer. They switched to clear, transparent, sulphurized SUNICUT.

100% improvement in drill life and much better finish were immediate results of the change. They are now able to drill 300 pieces before drills need regrinding. As an *extra* bonus they find SUNICUT permits increased spindle speeds . . . further stepping up their output.

Savings in time and money are direct result of the increased production and longer drill life made possible by SUNICUT in this plant. Similar savings are possible on many other metal-cutting operations in your plant. Why not consult with a Sun Oil Engineer today on selecting the right cutting oil for these operations. Call or write

SUN OIL COMPANY · ***Philadelphia 3, Pa.***

Sponsors of the Sunoco News Voice of the Air — Lowell Thomas

SUN INDUSTRIAL PRODUCTS

HELPING INDUSTRY HELP AMERICA

NAVAL BATTLES ARE NOT WON BY SHIPS ALONE!

It takes the best of men and materials to come out victorious. We know our men are the best, so it's up to us in the Arsenal of the United Nations to secure the best machinery obtainable in production of the best munitions of war.

Note in this close-up action photograph how conveniently the operator controls the SUPER SERVICE RADIAL at the N. Y. Shipbuilding Corporation . . . the low, centralized position of all controls at the head contributes to tangible savings in time and a great reduction in operator fatigue. The New York Shipbuilding Corporation reports not only definite savings from the use of the SUPER SERVICE RADIAL, but also "an improvement as to accuracy, speed and ease-of-handling".

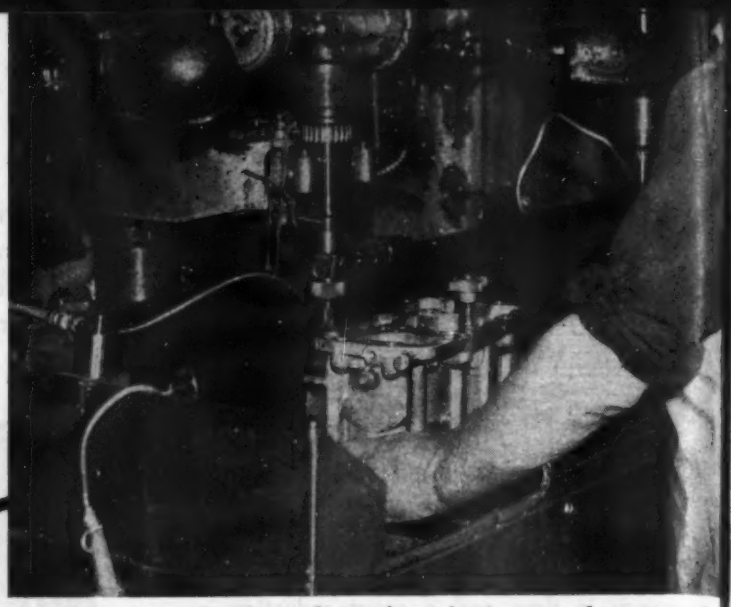
Drilling Condenser Head with the Super Service Radial at the New York Shipbuilding Corporation.

ARMY E NAVY

THE CINCINNATI BICKFORD TOOL CO.

OAKLEY · CINCINNATI · OHIO · U. S. A.

43 tapping operations on one piece



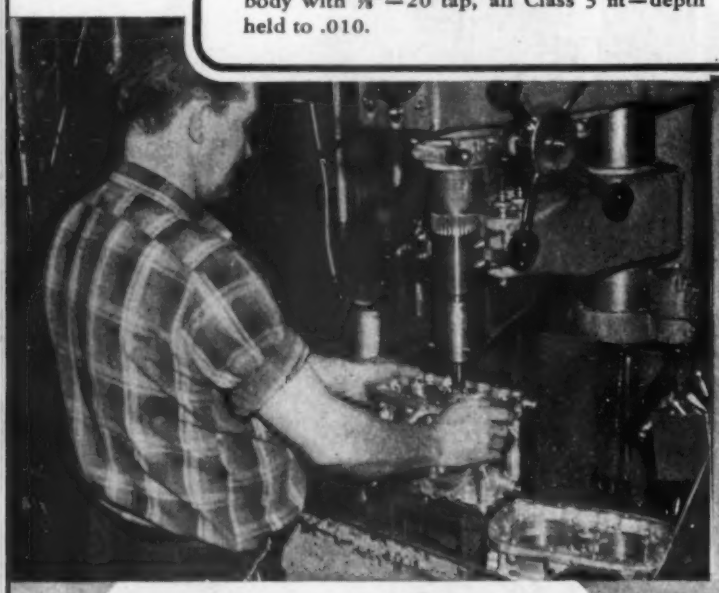
One of many aircraft parts made in a huge plant converted to war work i an aluminum carburetor body that requires accurate tapping of 43 hole *Name withheld at this time by request*

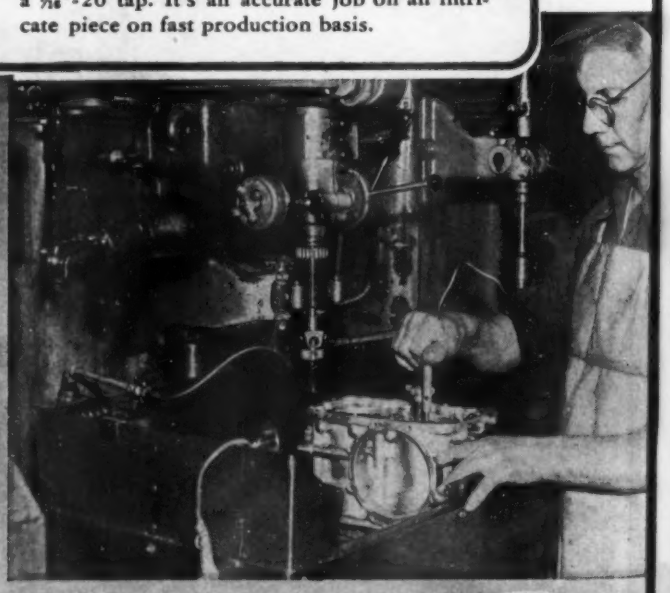
THE piece which comes to the Warner & Swasey Tapping Machines for final operation is an intricate part, beautifully finished and perfect in workmanship. It has been machined to precision limits under skilled hands. Now an error in thread accuracy means the scrapping of a vital piece—the loss of all the costly operations which have gone before.

This manufacturer experienced considerable trouble in holding the required thread accuracy on these parts. The installation of Warner & Swasey Precision Tapping and Threading Machines eliminated this difficulty. The revolutionary principle of solenoid actuated guide fingers operating against a precision lead screw produces threads as accurate as the tap itself. The many other improvements and special features found in Warner & Swasey Tapping and Threading Machines have stepped up production, tap life is prolonged, and rejects due to errors disclosed by go and no-go gages are neglible.

In this operation a Warner & Swasey No. 12 Precision Tapping and Threading Machine taps a series of holes in an aircraft carburetor body with ⅜"—20 tap, all Class 3 fit—depth held to .010.

The same carburetor body on a Warner & Swasey No. 11 Precision Tapping and Threading Machine. Here ten holes are tapped with a 7/16"-20 tap. It's an accurate job on an intricate piece on fast production basis.





WARNER & SWASEY *Precision* TAPPING AND THREADING MACHINES

are built in four models in capacities ranging from 0-80 to 1½" in steels, up to 2½" in soft metals and plastics; cuts internal and external thread, right or left hand, for class 3, 4, and 5 gage fits.

Ask your Warner & Swasey field man to explain the patented principle and many advantages of these new tapping and threading machines. Or send for catalog giving full description and specifications for each model, free on request.

WARNER & SWASEY Cleveland

YOU CAN MACHINE IT BETTER, FASTER, FOR LESS ... WITH A WARNER & SWASEY

TURRET LATHES, SADDLE AND RAM TYPES • CHUCKING AND BAR TOOLS • PRECISION TAPPING AND THREADING MACHINES

Only Yourself To Blame

A DISTINGUISHED MEMBER of the House of Representatives was speaking, and he wasn't pulling his punches.

He pointed an accusing finger at all of us in the room and let loose with a double-barreled blast.

"I've heard manufacturers complain about the kind of government they are getting. They say that Congress continually passes legislation harmful to their interests and particularly injurious to their future well-being.

"But where are these manufacturers when legislation is being considered in committee or when a program is in the formative stage?

"I serve on some of the most important committees in Congress, and I have yet to see a particular industry or a specific manufacturer come forth and give us the benefit of their thinking.

"Every other special group is articulate and makes its wishes known vigorously. Business men are either timorous or they don't want to be bothered.

"And what about the individual Congressman? Are the industrialists in his district avoiding him because he has the smallpox? He almost always wants to do what is best for his constituents and is receptive to advice.

"The views of labor organizations and of farmers and of other special interests are made known to him. Why don't business men acquaint him with their problems and what he can do to help?

"If a piece of legislation promises harm to industry, who are better qualified to tell him what is wrong than the business men in his own district?

"In case a proposed plan would make for a healthy economy and keep people employed in his district as well as elsewhere, the Congressman wants to know about it, and business men are the ones to post him on its merits."

Our speaker continued, "You get exactly the kind of government you are willing to work for. If you as a citizen are too busy to vote and won't be bothered by having to present your opinions on legislative matters to your Congressman, you have only yourself to blame.

"If Congress passes bills that you know are wrong and you or your industry, or both of you, haven't been vocal in registering your reasons for opposition in advance, then you have no valid reason to let out a loud yell of anger and to remark that the country is going to Hell.

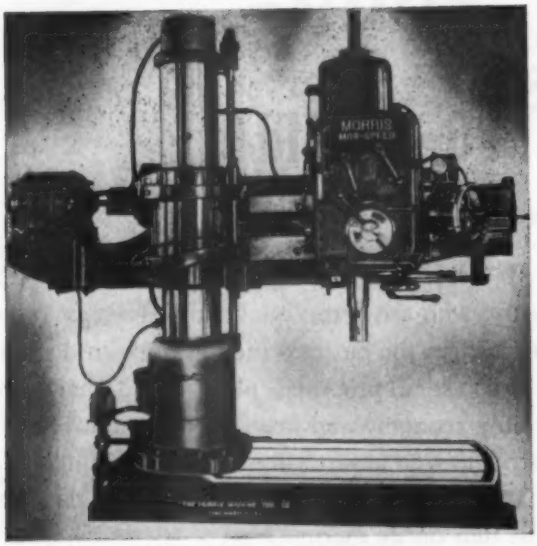
"Just because you may be speaking on behalf of your own interests is no excuse for silence. So long as you present your views honestly and forthrightly, keeping in mind the best thing for the nation as a whole, your own Congressman wants to hear what you have to say and so do the Congressional committees. You are not doing your duty as a citizen unless you speak up."

To all of which we add, "AMEN."

Burnham Finney

Engineered for the job

MORRIS *Special Multiple Drilling Machine*



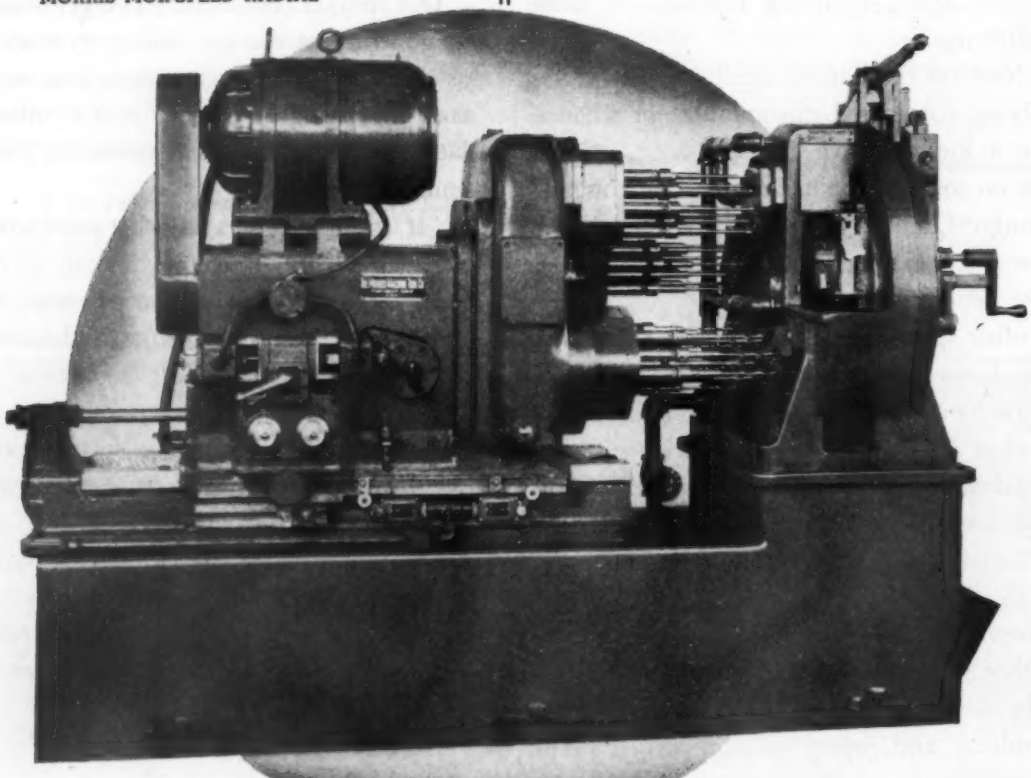
MORRIS MOR-SPEED RADIAL

• Many alert manufacturers are thinking today in terms of tomorrow's production. Plans are being formulated for new products, new processes and new methods of production.

Here's a typical example of a high production, single purpose machine designed to handle the drilling and reaming of bolt and pin holes in pump suction bodies—at a minimum cost per piece.

This machine has a 7½ H.P. hydraulic feed unit arranged for 32 spindles and electric controls for feed and reversing head motion. The 5 station indexing turret is provided with hand clamp fixtures so arranged that work may be loaded and unloaded while machine is in operation. Thus production is governed by the time of the longest operation.

If you are confronted with a production problem involving drilling, reaming, boring and tapping operations—or if you are contemplating a job requiring one or more similar operations consult Morris Engineers on equipment designed and built for your specific problem.



Builders of MOR-SPEED Radials

The MORRIS *Machine Tool Co.*

CINCINNATI 3, OHIO

Toolbits of 30-Deg. Radial Rake Speed Machining of Magnesium

BY PAUL THUT, SUPERINTENDENT, MACHINE DIVISION, THE TODD COMPANY

Thin-section magnesium alloy die-castings are machined at cutting speeds as high as 15,000 surface ft. per min. Two toolbits are used on the majority of cutters

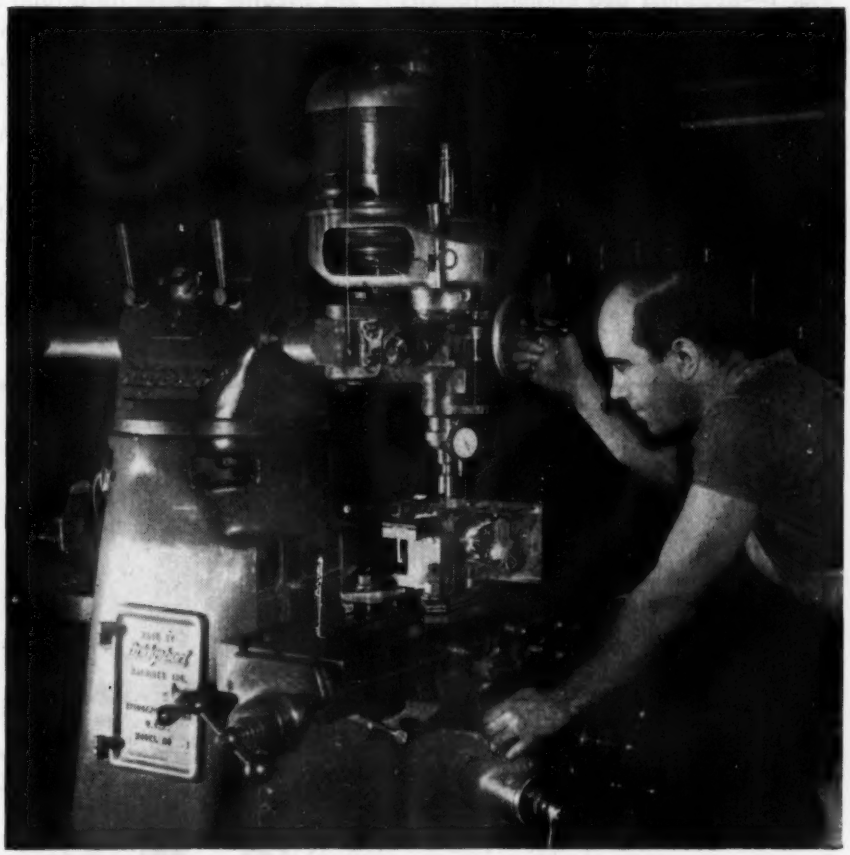
LIGHT MAGNESIUM ALLOY die-castings are being machined by the Todd Company at cutting speeds as high as 15,000 surface ft. per min. This is done with carbide-tipped flycutters, the toolbits having a top or radial rake angle of 30 deg. Chip loads are kept small, table feeds up to 30 in. per min. are used and no cutting fluid is employed. Two toolbits are used on the majority of cutters, one for roughing and one for finishing. The roughing tool is set between 1/32 and 1/8 in. ahead of the finishing tool, and the latter is set between 0.005 in. and 0.010 in. below the roughing tool. If this type cutter is not capable of removing the required amount of stock from a casting in one pass, a circular cutter having as many toolbits as necessary is used. The following advantages have been derived from these machining practices:

1. Set-up time for a job has been reduced to a minimum. Toolbits that become dull can be replaced in an average time of 5 to 6 min. Each machine set-up man is supplied with a number of left-hand and right-hand toolbits to make replacements without appreciable delay.

2. Die-castings with sections as thin as 1/16 in. are machined without distortion. The castings are absolutely cool upon completion of the cuts, and if proper table feed is used the finish compares favorably with that obtained by grinding.

3. It is unnecessary to wash the castings after machining, because no cutting fluid is used.

4. Fixtures used for holding the die-castings are of simple design and require only thumbscrews for holding the part. This is permissible because chip loads are small. Light clamping is especially desirable on thin-section



Many of the machining operations on the castings are done on universal milling machines. To reduce production time, a brake acting on the V-belt cone at the motor stops the spindle in less than one second when machining the magnesium component is completed

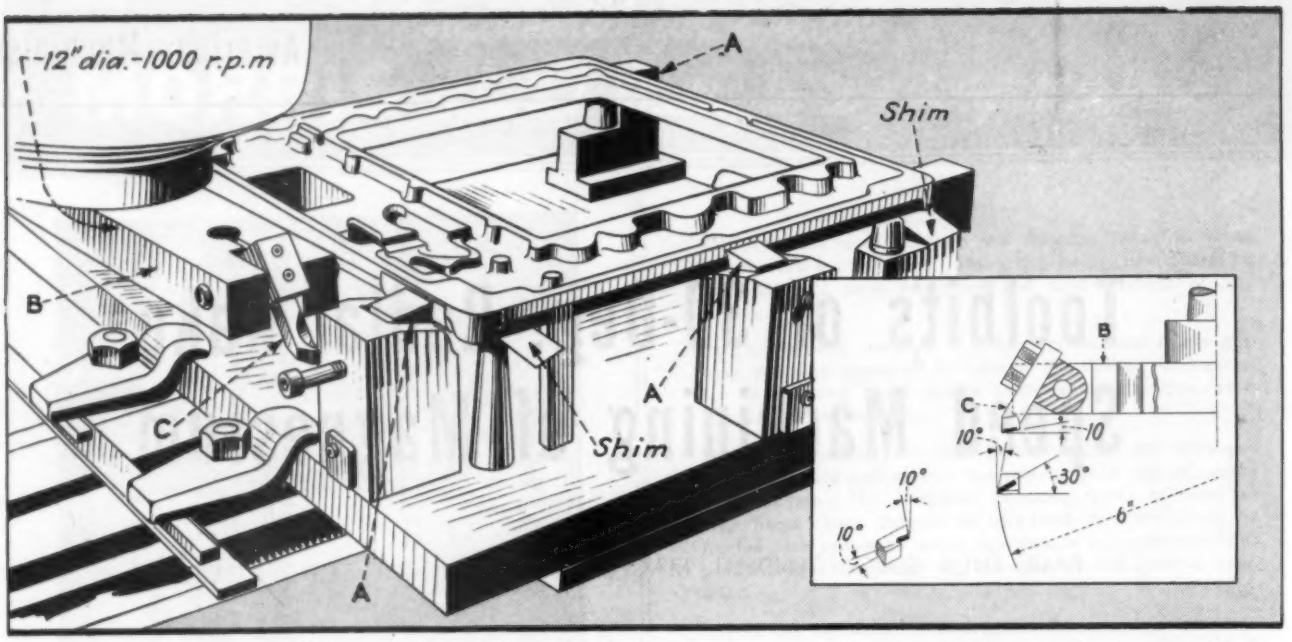


Fig. 1—Roughing and finishing toolbits in this flycutter are set for a total cut of 0.0675 in., the finishing tool being set 1/16 in. behind and 0.005 in. lower than the roughing tool. Although light clamping is used, the casting is machined at 3,150 surface ft. per min. without distortion

die-castings, which normally distort with rigid clamping, such as required for machining with multi-tooth cutters.

5. Fire hazards are virtually eliminated when using toolbits with a 30-deg. radial rake angle. Occasional fires resulted when using toolbits ground with a 25-deg. rake angle. A rake angle of 45 deg. has been used, and although it functioned satisfactorily, the cutting edge of the toolbit broke down too rapidly because of insufficient support.

Data on typical set-ups for machining magnesium die-castings with toolbits having 30-deg. radial rake are given in conjunction with the following illustrations.

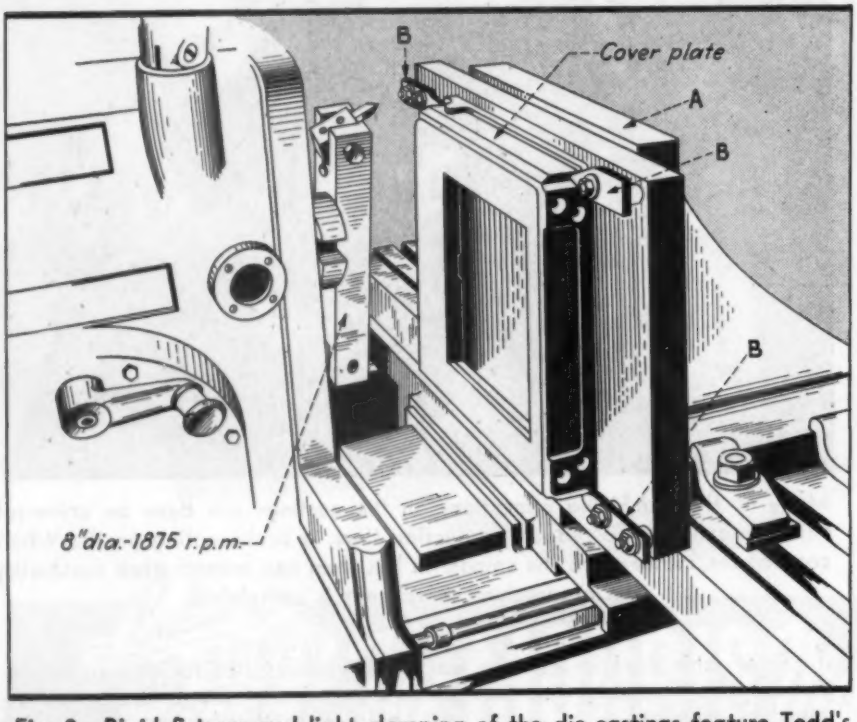


Fig. 2—Rigid fixtures and light clamping of the die-castings feature Todd's high-speed milling. Toolbits have clearance angles of 10 deg. and a top or radial rake of 30 deg.

The die-cast cover plate shown in Fig. 1 is held in the fixture by clamps *A*, and is leveled by shimming at the four corners. The entire top surface of this casting, including the inner rim, the bosses and the other rim, is milled with flycutter *B*, mounting two toolbits *C* set 12 in. apart. The roughing tool is set for a 1/16 in. cut, and leaves 0.005 in. for the finishing cut by the second toolbit. Spindle speed is 1,000 r.p.m., giving a surface cutting speed of approximately 3,150 ft. per min. Table feed is 10 in. per min. Fig. 1 shows the angles ground on both roughing and finishing toolbits. The angles are standard on all toolbits used by the Todd Company for milling magnesium alloy castings. The 30-deg. top or radial rake angle has been found to be optimum for tool life, surface finish and elimination of fire hazard. Side cutting edge, side rake, side relief and end relief angles are all ground to 10 deg.

Cover Plate Operations

Another operation on the cover plate is shown in Fig. 2. It is located by dowel pins on rigid fixture *A*, and is clamped lightly to the fixture by corner clamps *B*. The roughing toolbit is set 1/16 in. ahead of the finishing tool, and takes a 1/16 in. cut, leaving 0.005 in. for finishing. Machining is completed in one pass

of the cutter. The toolbits, set to a diameter of 8 in., cut at 3,940 surface ft. per min. with a spindle speed of 1,875 r.p.m. Table feed is 10 in. per min. Here, as well as in other flycutter operations, the highest available spindle speed and light chip loads are used, which, in conjunction with a moderate table feed, produce an exceedingly fine finish.

Milling A Box Cover

Two milling operations on a three-sided box cover is shown in Fig. 3. Dowels in fixture *A* locate the cover for machining the faces and pads at the open end as shown in Fig. 3. Clamp *B* secures the cover to the fixture. The set-up in Fig. 3 is typical of those for milling the three closed sides of the cover. Here it is located against pads *C* and pin *D*, and then secured by clamp *E* that exerts pressure on the casting at three points. Machining is done at maximum spindle speed of 1,875 r.p.m., using a 12-in. diameter flycutter, with a resulting cutting speed of 5,900 surface ft. per min. Table feed is 9¾ in. per min., and total depth of cut is ¼ in. Similar cutting speeds, feeds, and depth of cut are used to machine top surface *F* of this casting. Also, the same type fixture is used. The toolbits for these fly cutters are the same as shown in Fig. 1.

An end-milling operation with a cutter having a single cemented-carbide tip is shown in Fig. 4. Flange *A* of magnesium die-casting *B* is milled to a width of 0.453 in. and a depth of 0.177 in.—0.175 in. for roughing, and 0.002 in. for finishing. Hand feed is used. Previously machined top and bottom, the casting is positioned against pins *C* and secured when cover *D* is tightened by screwing bolt *E* and stud *F* into tapped holes in the fixture. Additional clamping is effected by tightening pad *G*. The 13/16 in. cutter, mounted in the spindle of a universal miller, is run at 4,250 r.p.m.

Set-up for Magnesium Casting

The set-up shown in Fig. 5 is typical of those employing single inserted toolbit cutters. Thin-section magnesium casting *A* is positioned against blocks *B*, *C* and *D* which are bolted and doweled to the base of a rigid fixture. It is secured by tightening clamp screws *E* and *F*. The table is fed horizontally and then transversely by hand to machine surface *G*, removing 3/32 in. stock in one pass of the cutter. Cutter diameter is 1½ in., and spindle speed is 4,250 r.p.m. Here, as in all the operations, light chip loads and high cutting speeds permit light clamping, eliminate distortion, and produce a finish comparable to that obtained by grinding.

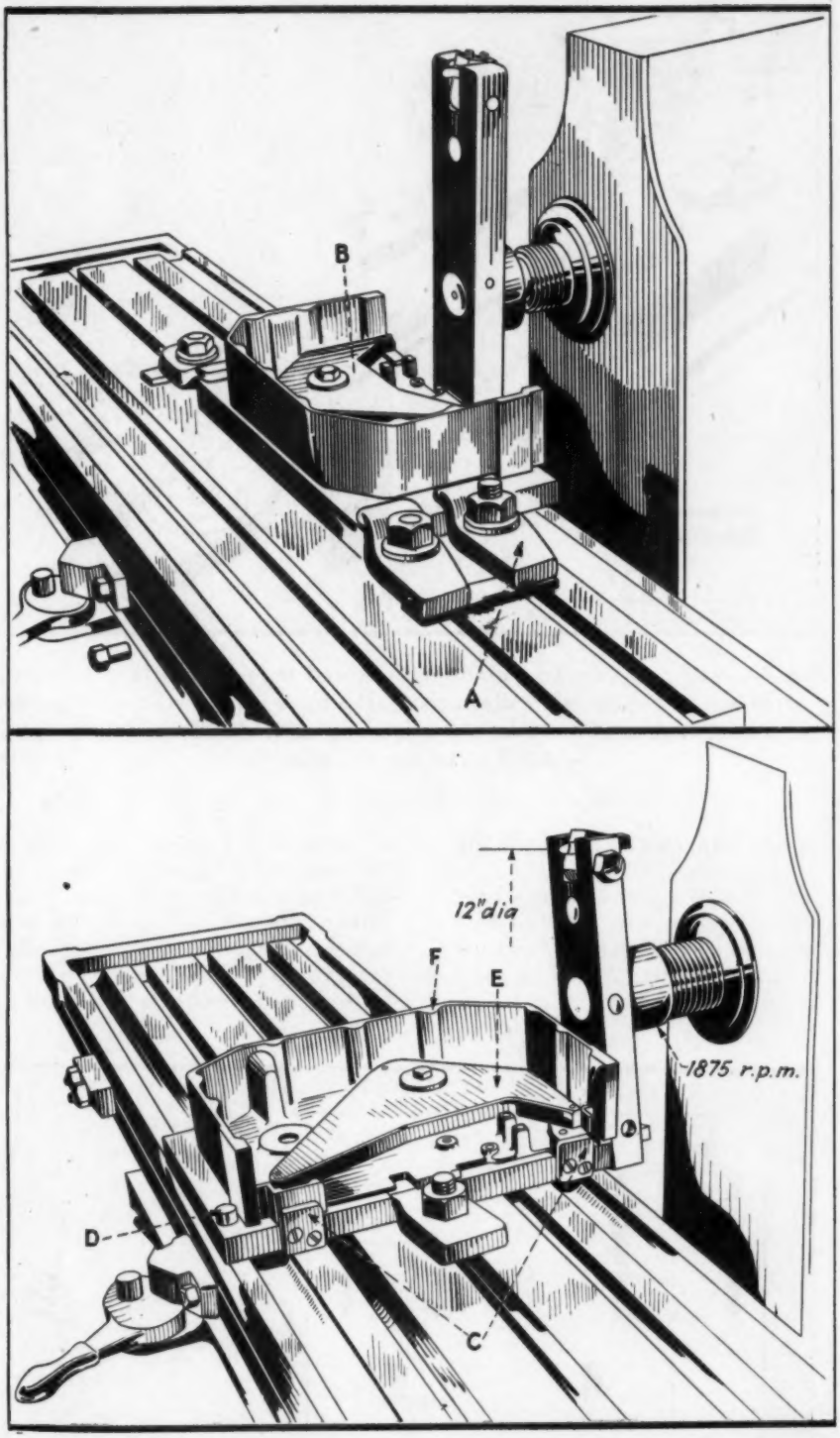


Fig. 3—These 12 in. flycutters are run at 1,875 r.p.m., giving a surface cutting speed of 5,900 ft. per min. The surfaces are milled in one pass of the cutters. Depth of cut is ¼ in., and feed is 9¾ in. per min.

A counterboring tool, mounted eccentrically in a toolholder for adjustment to various radii, is shown in Fig. 6. It is set for counterboring hole *A* to 1,592 in. diameter, and a depth of 3/16 in. The casting is set up by placing it on fixture *B* and centering the pilot of the counterbore in hole *C*, which was previously drilled and bored; finally, clamps *D*, *E* and *F* are tightened. The counterbore is run at a spindle speed of 1,050 r.p.m., and fed to the casting by hand. Depth of the counterbored hole is controlled

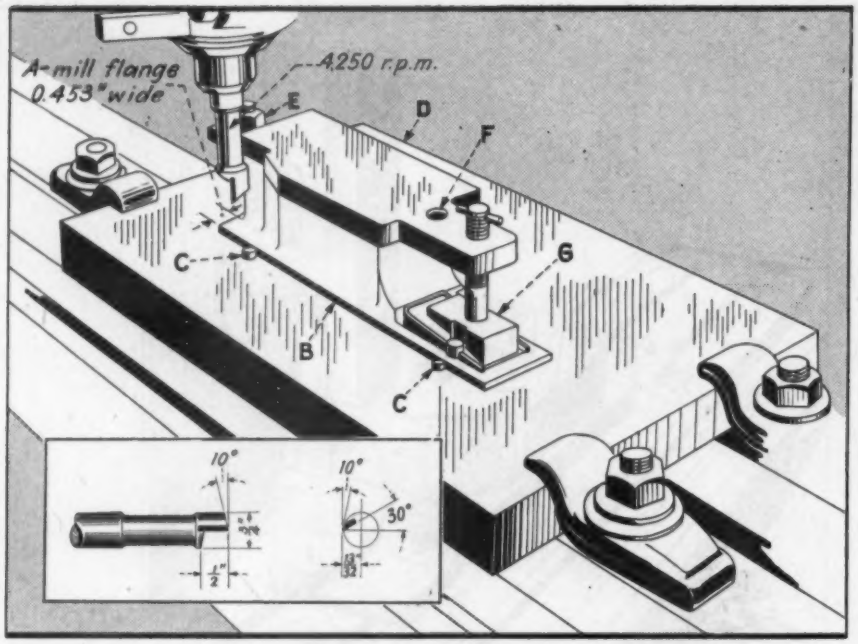


Fig. 4—A single cemented-carbide tip is brazed to this cutter to mill the bottom flange of a magnesium die-casting. The table is fed by hand while making a roughing cut of 0.175 in. and a finishing cut of 0.002 in. Spindle speed is 4,250 r.p.m. for this operation

by dial indicator *G*, as shown in Fig. 6.

Counterboring of magnesium castings is also done with the type of tool shown in Fig. 7. The tool illustrated is fed by hand while running at 4,250 r.p.m. to counterbore hole *A* to 1.250-in. diameter and a depth of 0.156 in. It removes 1/4 in. stock on the diameter. A hole previously drilled and bored to size in the casting is a sliding fit on bushing *B* which is bolted to the base of the fixture. Once centered on this bushing, the casting is fastened by eccentric clamps *C* and *D*.

The tools shown in the drawings are typical of those required for the many and varied operations on magnesium die-castings being machined by the Todd Company. However, the set-ups vary from job to job. For example, three surfaces are straddle milled on one casting by three flycutters mounted on a milling machine arbor, the bars and toolbits being of the same design as shown in Figs. 1, 2 and 3. The toolbits are set to a diameter of 10 in., and the arbor runs at 1,500 r.p.m. Cuts up to 3/32 in. are taken at table feeds from 10 to 15 in. per min. On another job, four flycutter bars are mounted on the arbor for straddle milling, each pair of bars being mounted 90 deg. apart, and set up to straddle mill outside surfaces of castings. The four toolbits in each pair of bars are set slightly behind and below each other to minimize chip load when heavy cuts are required.

For a slotting operation, a single carbide tip is brazed to a cutter body having a straight stem to fit a hole drilled off-center in the end of a holder. Thus, the body can be adjusted eccentrically to cut various widths of slots.

The Todd Company attributes its success in milling magnesium alloy castings to the 30-deg. radial rake ground on the toolbits, which in general has heretofore been considered impracticable by the users of cemented carbides.

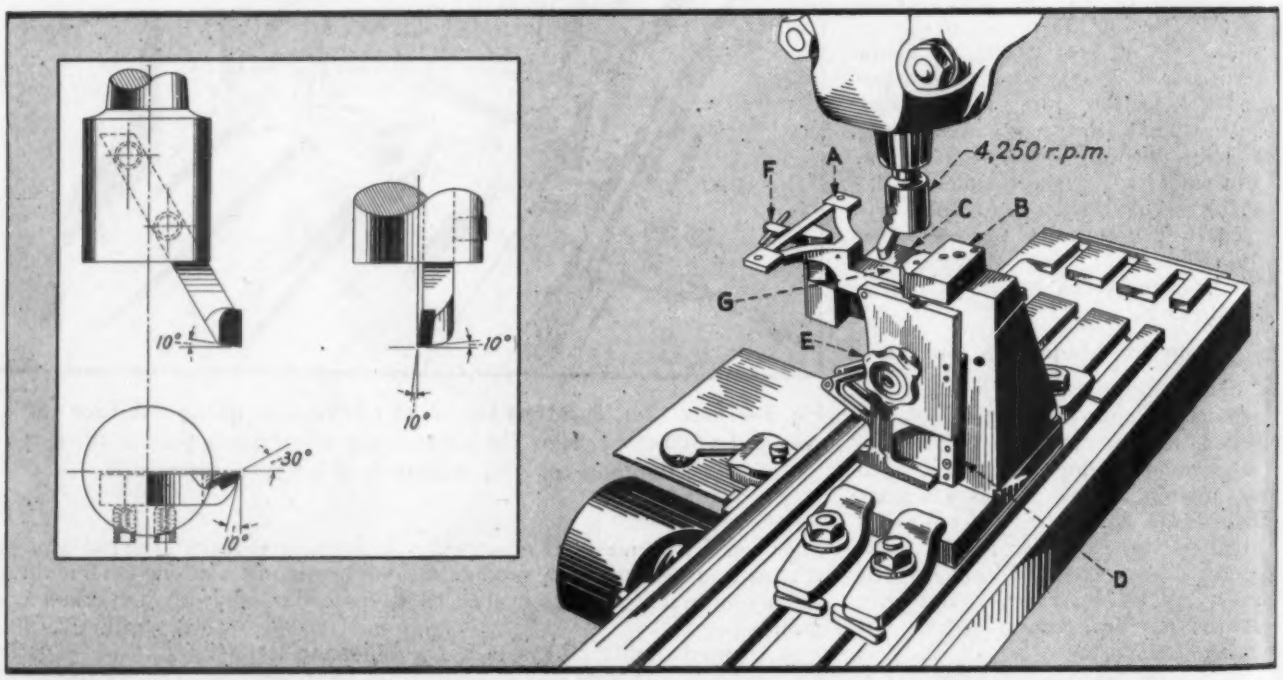


Fig. 5—This set-up is typical of operations performed with a single carbide-tipped toolbit, which has 10 deg. clearance angles and 30-deg. radial rake. While machining, the table is moved horizontally and transversely by hand, over-run being prevented by table stops

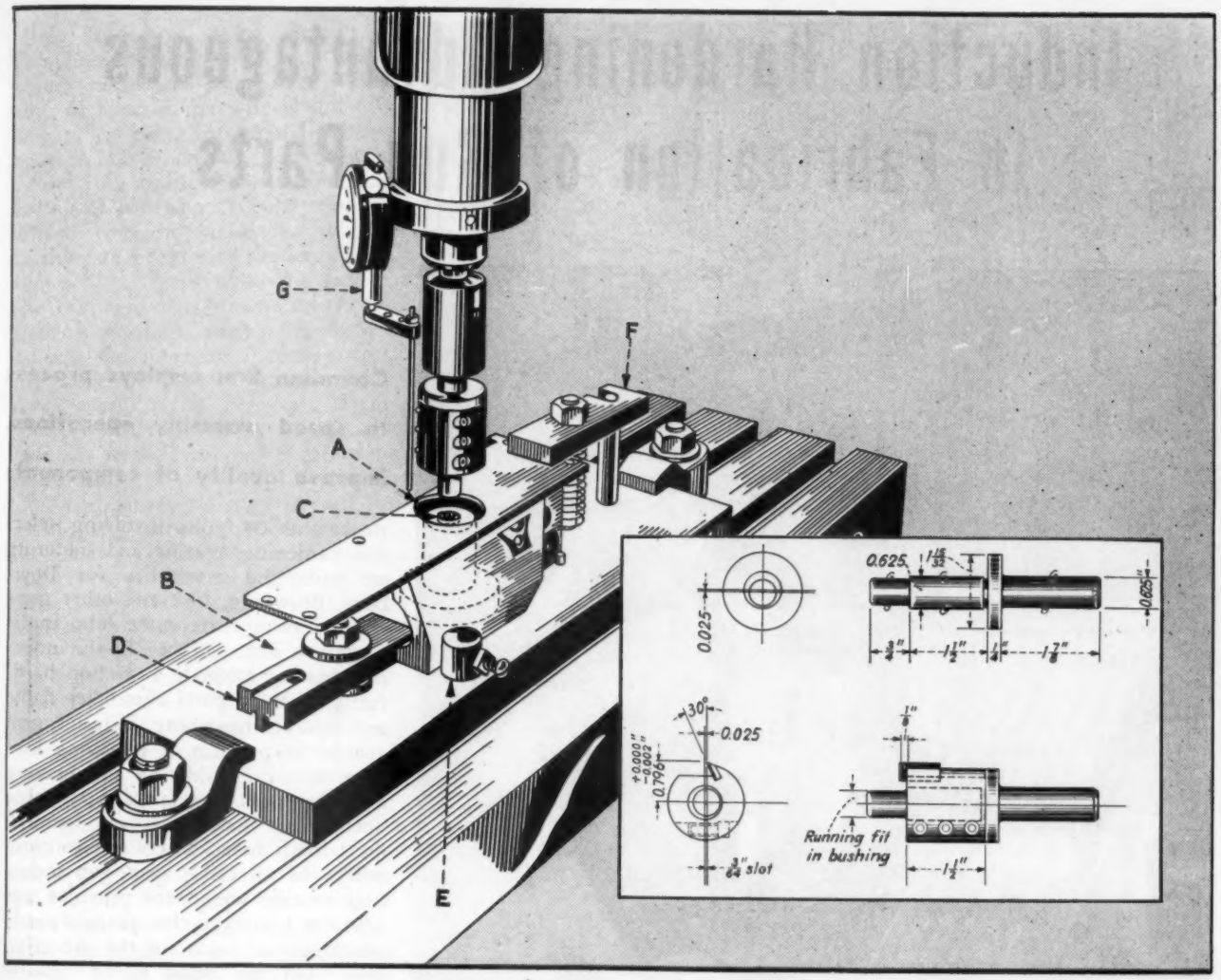


Fig. 6—Holes are counterbored in magnesium die-castings with this type tool, which can be adjusted eccentrically to various diameters. The hole in this casting is counterbored to 1.592 in. with the tool running at 1,050 r.p.m, and advanced by hand feed

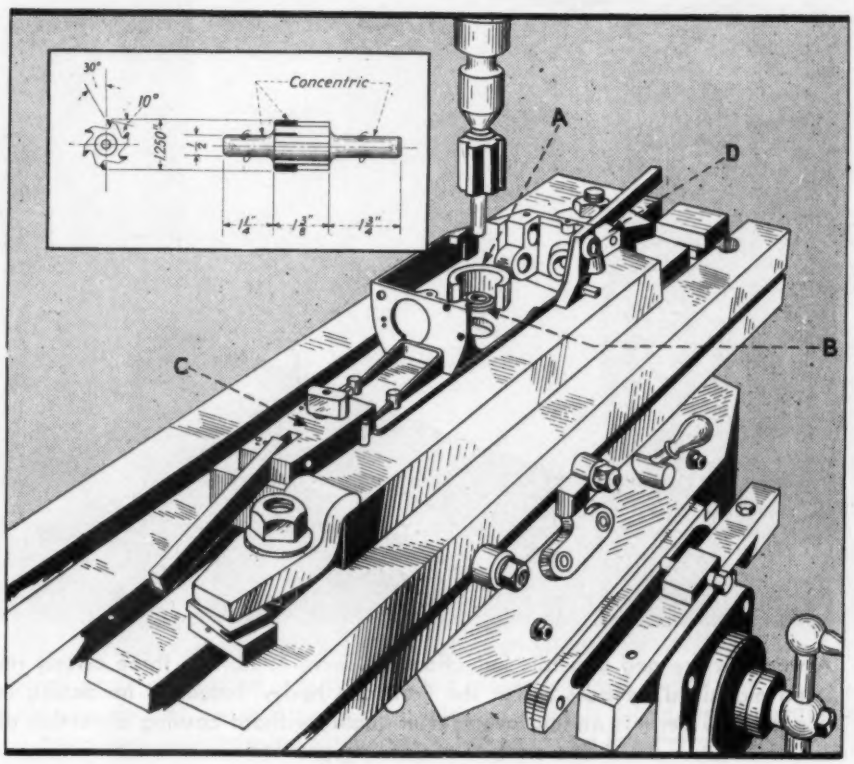


Fig. 7—Six fluted tools with radial rake of 30 deg. are also used to counterbore holes in the magnesium castings. Hand feed and a spindle speed of 4,250 r.p.m are used. The pilot runs in a bushing bolted to the fixture and ground for a sliding fit in a hole previously bored in the casting

Induction Hardening Advantageous In Fabrication of Gun Parts

A wood fixture and a simple induction coil serve to harden three closely related machined surfaces within the Bren gun body. Induction hardening in this instance permits an improvement in quality without causing distortion of the part or a cleaning problem

Canadian firm employs process to speed assembly operations, improve quality of components

HUNDREDS OF JOBS involving selective hardening, brazing and soldering on parts and assemblies for Boys, Bren, Browning, Colt and other guns are now being done at the John Inglis Company, Ltd., Toronto, by the induction heating method. Induction hardening of these parts eliminates flame and lead-pot hardening, is faster, and avoids the problem of removing lead from recesses. Soldering and brazing by the process have speeded assembly operations. Some jobs are handled on a batch basis, others run continuously. In all cases, spark-gap induction heating equipment provides satisfactory heating cycles, permits ready attachment of leads for the induction coils, and the broad tables provide room for fixtures of various size. Many of the fixtures are made largely of wood.

One of the jobs being handled on a batch basis is that of hardening three closely related machined surfaces in the interior of the Bren gun body. Induction hardening provides a means of improving the quality of the component, avoids distortion of an item that has passed through many expensive machining operations and gives a simple means of applying heat within a confined space.

The Bren body is placed vertically in a wooden fixture that is fitted with a formed induction coil made to enter the recess. A locating pin and a latch hold the part safely in position. By pushbutton, the operator starts the timed heating cycle, which has a duration of 37 sec., after which the current cuts off automatically. Thereupon the operator removes the piece from the fixture and suspends it in a quench tank. As gun bodies are removed from the oil, they are placed upon a removable drain rack placed on top of the quench tank.

Assembly of the Bren flash eliminator tube and bracket is done by

silver soldering. Joint surfaces of components are coated with silver-solder paste, and the bracket with a ring of silver-solder wire is slid over the tube, being positioned with a gage. Thereupon the assembly is placed in a four-position fixture, consisting of four short tubular members spaced vertically on a bar attached to the ram of an air cylinder. When the operator steps upon the treadle, the cylinder raises the fixture to the heating position, current is thrown on and the automatic induction heating cycle of 42 sec. transpires. In other words, four pieces are assembled at once in this cycle, and the manual work involved is comparatively light.

A belt-conveyor fixture is used for small parts to be induction hardened in quantity. Belt pulley at the right-hand side is driven by a small motorized speed reducer. Transite blocks, molded to receive the parts, are riveted to the belt. The operator places the parts in the blocks as they pass from right to left. A suitably formed induction coil, which follows the contour of the driven pulley, is made in the proper length to heat the component to the desired temperature before the piece drops off the belt and into the oil-quench tank. This belt-conveyor fixture performs its work so swiftly that it remains idle much of the time awaiting further production. The fact that it does expedite the production of small parts is a principal reason why induction hardening has been applied so extensively by John Inglis Company. Scores of new inductors are being made up each month, as design and process engineers see opportunities to speed production and improve quality.

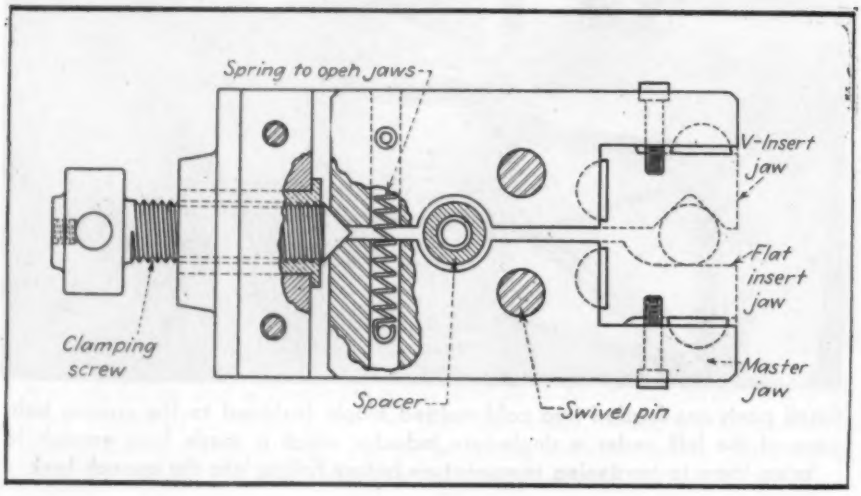
A bracket is silver-soldered to the Bren flash eliminator in a fraction of the time required by a previous method. A four-station fixture helps further to speed output of flash-eliminator assemblies

Small parts are loaded into cold-molded blocks fastened to the canvas belt, pass at the left under a single-turn inductor which is made long enough to bring them to hardening temperature before falling into the quench tank

Position Indicators

DESIGNERS of postwar equipment may utilize small self-synchronous motors as position indicators. Movement of a machine element can be transmitted instantly to a remote point through the combination of a transmitter motor and a receiver. Most self-synchronous motors have extremely low power output, usually a few watts. In such cases an electronic power amplifier may be used to pick up the power impulse from the transmitter and increase it sufficiently to operate a more powerful type of receiver. Gear trains and cams are often included in the position-indicating system. Such systems can be combined to add or subtract movements of respective indicators.

Lightweight, Simple



A hand-operated, self-centering fixture such as this, with interchangeable jaws, can be used for a number of parts. Here, thin-wall brass parts, silver plated, are tapped to within two threads of the bottom. Production is at the rate of 1,050 pieces per hr., with the 1⅛ in.-32 tap operating at 800 r.p.m. when cutting and 1,600 r.p.m when reversed. Parts are placed from the bottom and located against a shoulder in the jaws. Insert jaws of any required shape can be fitted in the master jaws. A slight turn of the handle is sufficient to open or close the jaws. Inset shows how the jaws are actuated, by the spring which forces them open to drop the piece.

Fixtures Pave Way for High-Speed Tapping

BY HERMAN GOLDBERG, CHIEF ENGINEER, R. G. HASKINS COMPANY

Since loading often takes more time than actual tapping, care must be taken to design fixtures for fast loading, as well as to hold and support pieces properly

PROPER TAPPING FIXTURES can often eliminate many of the troubles encountered in tapping to close tolerances. The average fixture is a simple affair, but there are certain fundamentals which must be considered. Too often little consideration is given to chip clearance and to methods of supporting work. Sometimes variation in the work makes difficult the task of locating the piece with reference to the tap. While this is not serious on a tapping machine having a floating spindle, it is important when tapping at high speed with a rigid spindle and a non-floating holder, such as are necessary to get maximum life from a tap.

When a hole is out of line with the tap, it may bend the tap and cause trouble when the tap reverses. This is especially true with small taps. A tap tends to straighten itself when backing out and this makes it cut backwards. This is often responsible for tap loading. If the tap tips the piece when it first enters the hole and starts to cut, the hole is thrown out of line with the axis of the tapping machine and the tap enters at a slight angle. The same thing happens when the tap reverses. On irregular castings, where there are slight variations in size and no machined locating surfaces, it is difficult to hold size. Fixtures for such castings must be made loose enough for the total variation in all castings. In certain cases this causes the tap to cut bell-mouthed holes, if too much clearance is allowed.

Complicated Fixtures Not Necessary

Many difficulties could be overcome if the parts being tapped were clamped in the fixture. This requires additional time and often is unnecessary if proper consideration is given the locating points for parts being tapped. It is not necessary to build complicated fixtures. Usually, no hold-downs or clamps are necessary, especially when tapping with a machine that has a rigid, non-floating spindle. Thin sections should be well supported directly underneath the hole being tapped, so there is no spring from pressure of the tap as it enters work.

Some parts may have considerable float in the fixture and yet no difficulty is experienced when tapping to close tolerances. At the same time, with the same material, fixture, tap and machine, difficulty may be found in holding size. In tapping ordinary hexagon nuts in a tapping machine, one lot can have a 1/16 in. float all around and tap a perfect Class 3 fit, yet the next time the job is run it may be difficult to maintain even a Class 1 fit. Arranging the fixture so that clearance is only a few thousandths sometimes eliminates this trouble and still makes loading easy.

Tapping Less Than Handling Time

In high-speed tapping, especially in sizes up to 5/16 in., tapping time is usually much less than handling time. It is important that consideration be given to handling time when designing the fixture. This involves many factors, including the proper height of the fixture so that the hand is not crowded when inserting the piece, and the angle at which the part is placed in the fixture in relation to the operator. Certain parts can best be placed from the right or left side, sometimes it is more practical to place them at an angle, and at other times it is easier and quicker to place the part from the front of the machine. There is also the problem of removing the piece after it has been tapped. If it lends itself to being pushed through, fixture design is simplified. In other cases some type of spring ejector can be used. Time required to remove the piece and place it in a pan is also important. Often it can be dropped in a chute. This usually saves time and increases production. Fixture design should be such as to make it easier for the operator to locate the piece in position, and to remove it.

It is sometimes a mistaken idea to have extra long fixtures for small pieces and slide the part through, as the sliding time is often greater than actual tapping time. Where parts can be fed through an open fixture, a disappearing pin or ball stop may be advantageous as it relieves the operator of eye strain in locating the piece.

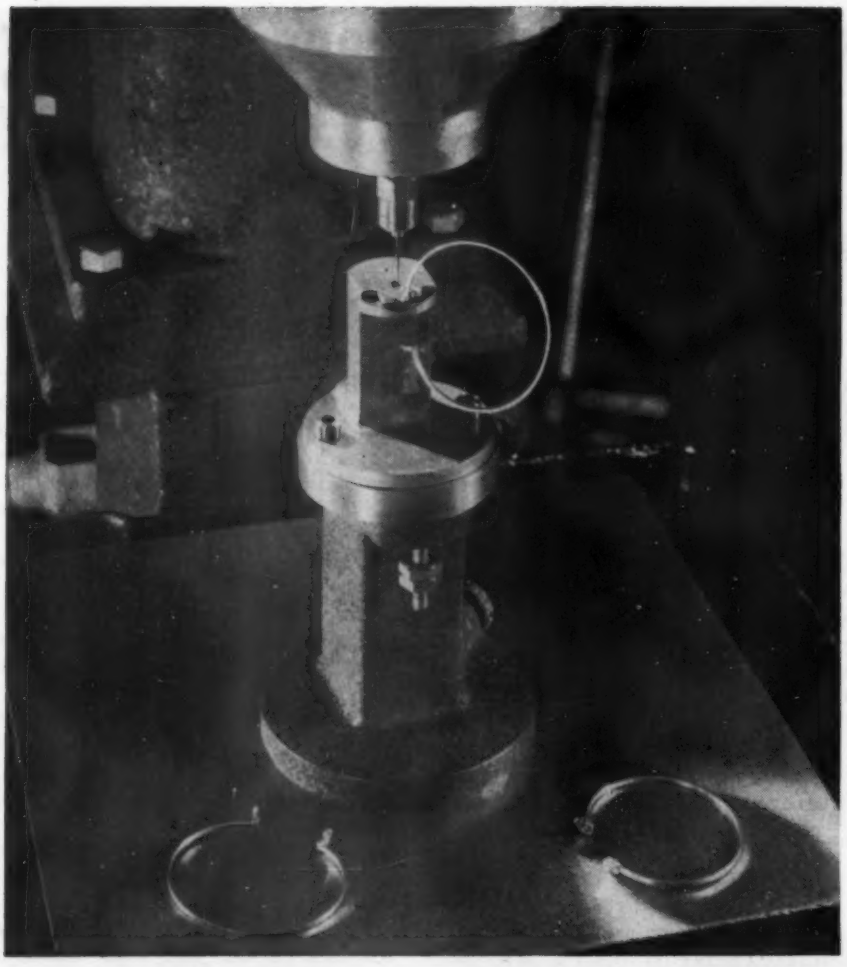
The variety and character of the different parts to be tapped make the design of fixtures a constantly differing problem. Extra time given to the design of tapping fixtures will be well worth while.

Certain classes of work require that the tapped hole be accurate, parallel or in line with some other hole or locating surface. When extreme accuracy is required, the tool designer can resort to a standard drill bushing for locating the tap. Such bushings soon round over the outside points of the tap, shortening its life. If bushings are absolutely necessary, it is advisable to make a revolving bushing, and, if possible, use ball bearings. This relieves the tap of rubbing against the bushing's hardened wall. When bushings are used attention should be paid to the method of getting oil into the tapped hole, as a tap revolving at high speed tends to swing oil against the wall of the bushing and thus act as a seal, permitting very little oil to get down into the hole being tapped.

Lightweight Fixtures Should Be Used

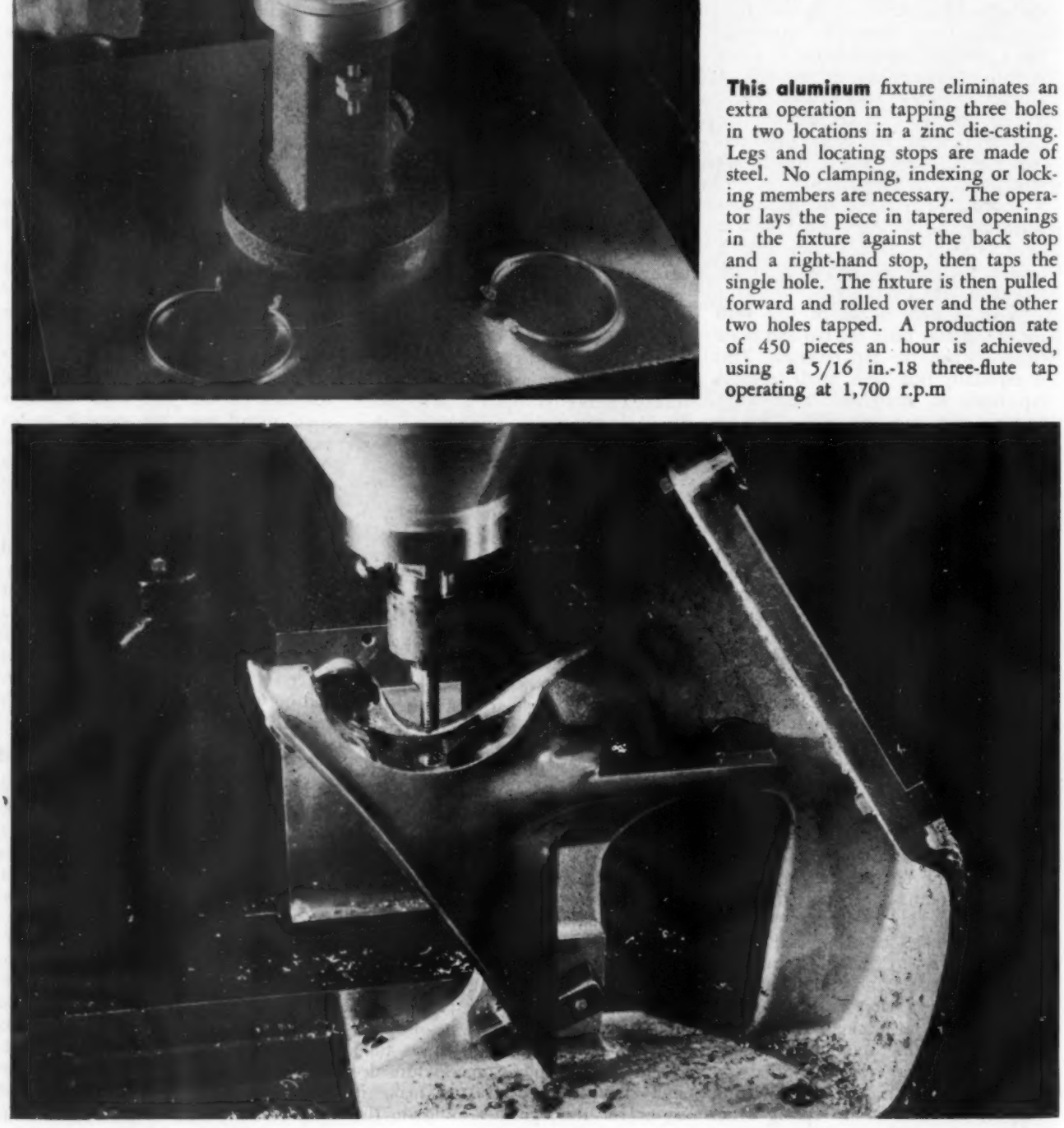
Lightweight fixtures should be used if they are to be moved each time one of several holes are tapped in a piece. The weight of the fixture has a direct bearing on production. For instance, if there are ten holes to be tapped in the piece and the production is 1,000 holes per hour, the operator would have to move the fixture 1,000 times every hour. If the fixture weighs 30 lb., he would have to move 30,000 lb. an hour. This is important from a fatigue standpoint.

When tapping second-operation screw machine work made of bar stock, it is necessary usually to clamp



A vertical air-cylinder and piston moves the work held in this fixture up and down as required, while the rotating tap spindle is held in fixed position. Parts being tapped are spectacle frames, but similar fixtures are often used on clock parts and like jobs. With this set-up, a 0.045 in.-90 tap is operated at 2,300 r.p.m. while cutting and at 4,600 r.p.m when reversed

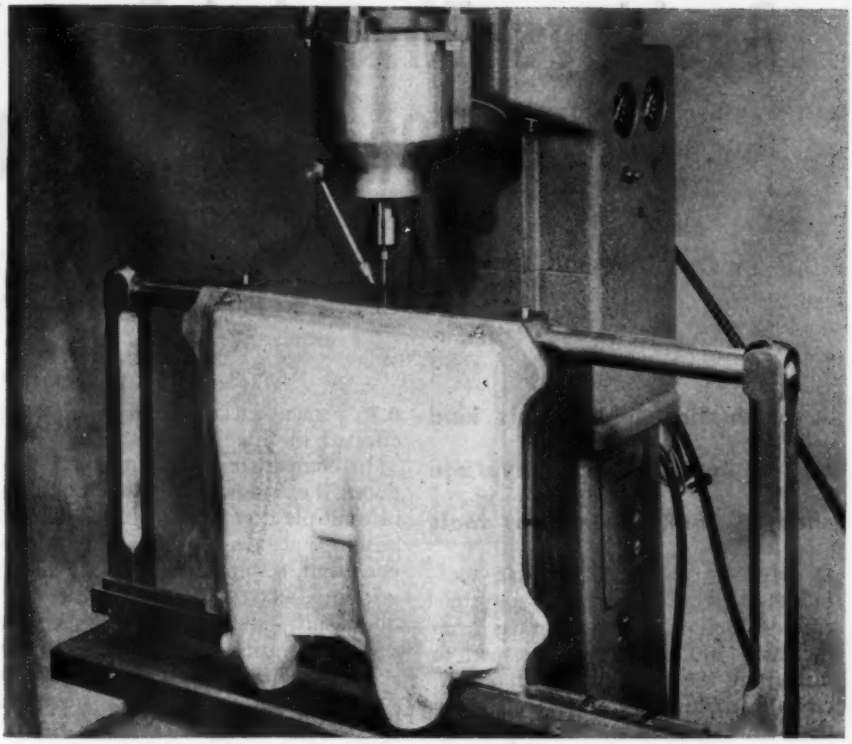
This aluminum fixture eliminates an extra operation in tapping three holes in two locations in a zinc die-casting. Legs and locating stops are made of steel. No clamping, indexing or locking members are necessary. The operator lays the piece in tapered openings in the fixture against the back stop and a right-hand stop, then taps the single hole. The fixture is then pulled forward and rolled over and the other two holes tapped. A production rate of 450 pieces an hour is achieved, using a 5/16 in.-18 three-flute tap operating at 1,700 r.p.m



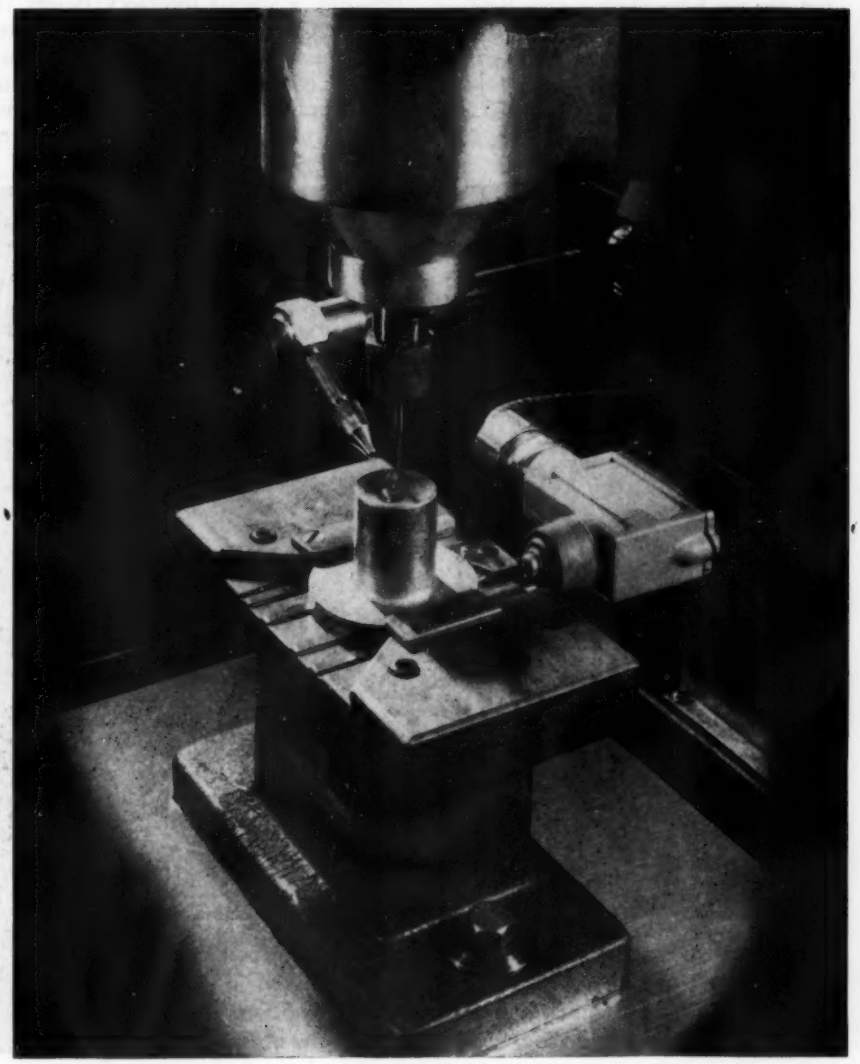
parts. In designing a clamping fixture, it is important that the jaws or clamping members be self-centering. If there is any variation in the diameter of the work, a device with only one movable jaw throws the hole out of line with the tap. If the part is clamped rigidly, unnecessary strain is thrown upon the tap by causing it to remove more metal from one side than from the other and difficulty is experienced in holding size. It is always best to design fixtures so work and tap are lined up automatically.

Most fixtures are made of grey iron castings and SAE 1020 or 1030 steel parts carburized and hardened before final grinding to size. Most fixtures can be made in any toolroom equipped for jig and fixture work.

Some simple, inexpensive and interesting fixtures are shown here.



Six 1/4 in.-20 blind holes are tapped in each of two opposite sides of this aluminum casting. The notched bar locates the sliding carriage for tapping each hole. When a hole has been tapped, the operator lifts a latch at the rear of the fixture and slides the carriage along until it catches in the next notch. The casting is located by four pins. The 3/8-in. deep holes are tapped with a No. 1 tolerance two-flute helically fluted tap operating at 1,000 r.p.m. when cutting and 2,000 r.p.m. when reversing, to produce a Class 3 fit



Precision electric switches can be used in tapping fixtures to operate solenoid valves to close the fixture, or to start the tapping cycle of the machine, or both. Such switches are also used for automatic control of the entire tapping cycle. When this is the case, the operator inserts a part into the fixture and the tapping head moves down, starting the cycle. When the tap engages the piece, the operator releases the part, which is then held in place by the tap. When the cycle is completed, the head moves up and the part is automatically ejected. With this fixture, operating on the above principle, production of 1,200 pieces per hr. is easily attained

Bushings Threaded Four Times Faster With Carbide-Tipped Tools

BY C. O. AVERILL, GENERAL SUPERVISOR, TOOL, GAGE AND CUTTER GRIND DEPARTMENTS, JACOBS AIRCRAFT ENGINE COMPANY

A production job of this kind can be handled by the average shop at small expense for tools

BY MEANS OF interchangeable toolblocks fitted with two preset tungsten-carbide toolbits, production has been increased 300 percent with respect to machining the external thread on aircraft sparkplug bushings The operation is carried out on a standard Lodge & Shipley 14x30 in. engine lathe. Output per ten-hour shift ranges between 750 and 800 bushings, with less than one percent scrap. From 6,500 to 7,000 bushings are obtained per tool grind despite the nature of the material—89 percent bronze, 10 percent aluminum, 0.75 percent nickel. Tool changes are effected in three minutes.

In comparison, prior methods produced the following results: hobbing, or multiple thread milling, 175 to 210 bushings per ten-hour shift, 300 pieces per grind, set-up time 20 min.; thread grinding, 200 to 210 pieces per ten-hour shift, the wheel was specially dressed to grind the thread and crest at the same time and hold the corners square, wheel dressing was required every five pieces.

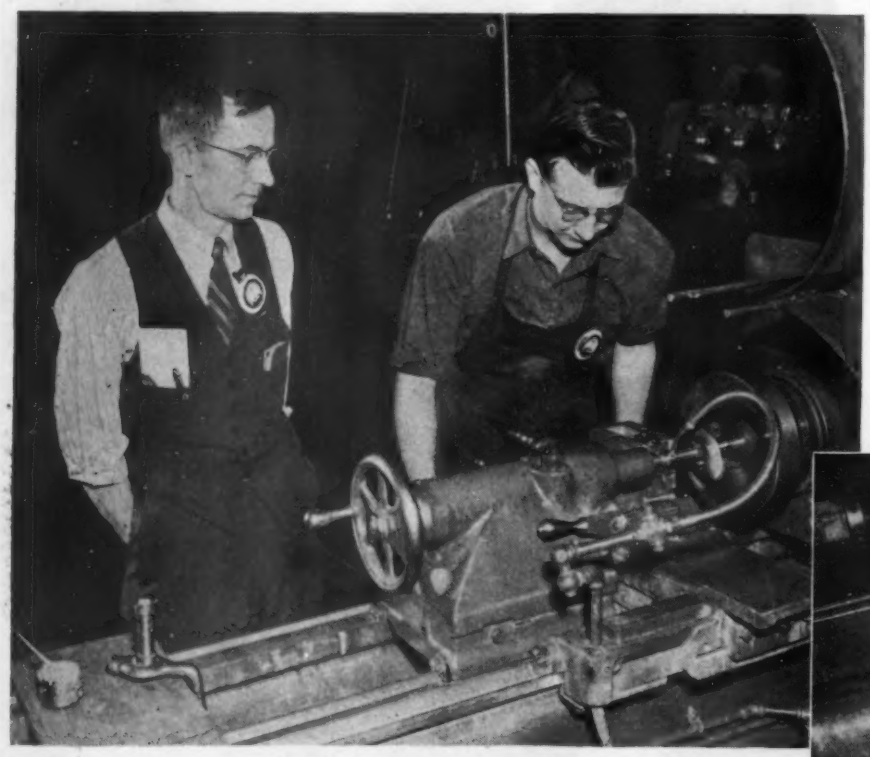
To set up the lathe for threading the bushing, a special toolblock holder is mounted on the cross-slide and square with the centers of the machine. The holder is locked in place with two socket-head capscrews. The heads of these screws are filled with wax to prevent tampering with holder setting.

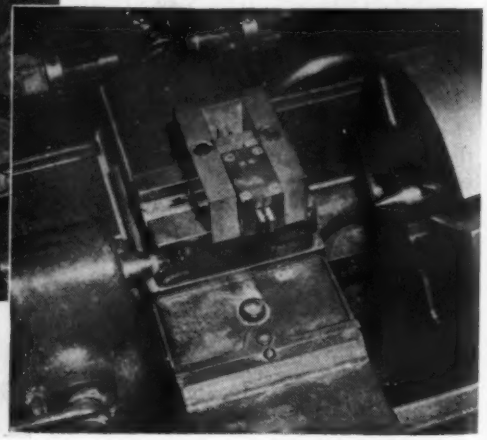
It is necessary to set over the tailstock in order to cut the tapered thread. For this purpose a mandrel of the same length as the work arbor is mounted between centers. This mandrel is ground to the proper taper, which is 1/32 in. per inch. The tailstock is adjusted until a 0.0001 in. indicator mounted on the toolholder reads 0.0 at both ends of the mandrel.

The toolblock is positively located against one side of the recess in the holder by means of two headless setscrews. A screw with two locknuts positions the toolblock with respect to the rear of the holder and insures firmness of the assembly.

Toolbits are preset in the toolholder so that the distance from the back of the holder to the point of the tool is the same in all assemblies. Adjusting screws are found in the rear of the holder. The point of the root and pitch tool is set 0.0446 in. ahead of the crest tool to hold the bushing concentric and the crest width to 0.0068 in. In addition, two headless setscrews directly under each tool are used to set them to ± 0.001 in. with respect to the center of the work arbor. When tools are ground, they are easily adjusted to center height. Two headless setscrews on top of the block hold each tool in position.

Both tools are fitted with Firthite





Production averages 78 bushings per hour. The toolblock with its two pre-set carbide-tipped tools is easily exchanged in the holder in three minutes. Tool changes are infrequent compared with past experience because from 6500 to 7000 pieces are obtained per grind

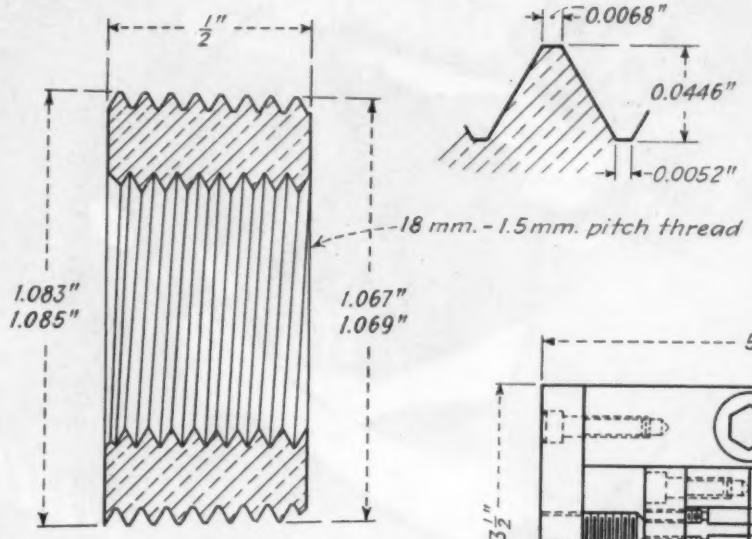
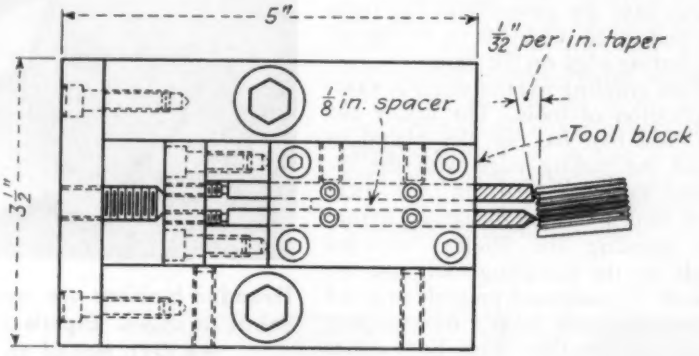
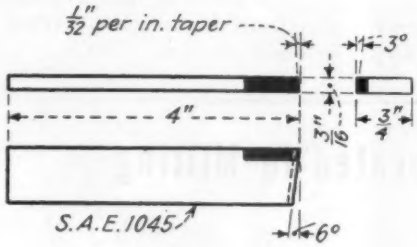


FIG. 1





Crest Tool

FIG. 3

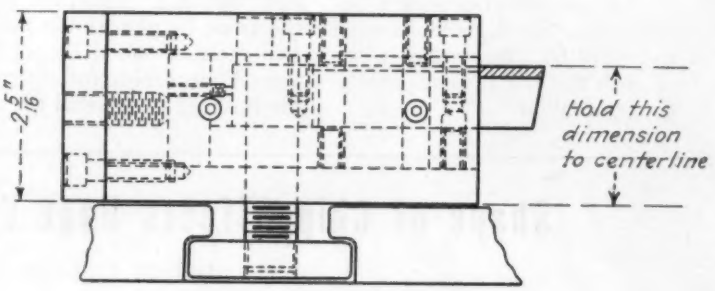
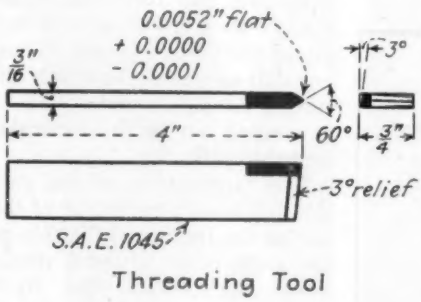


FIG. 2



Threading Tool

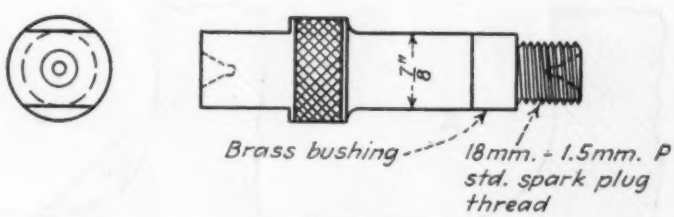


FIG. 4

Fig. 1—The operation consists of cutting a 16-pitch left-hand thread on the O.D. of the aircraft bushing. Fig. 2—Two setscrews positively locate the toolblock against one side of the recess in the toolblock holder. Fig. 3—The crest tool and the threading tool are provided with Firthite HA grade A46-4 tungsten-carbide tips. Fig. 4—A threaded arbor holds the bushing while cutting the 16-pitch thread on the external diameter

HA grade A46-4 tungsten-carbide tips. The crest tool is ground with a cutting edge tapered 1/32 in. per inch, a side rake of 3 deg., and an end relief angle of 6 deg. The threading tool is ground to a 60 deg. included angle, a 3 deg. side rake and a 3 deg. side relief, with the sides ground square with the bottom. When these tools are fitted into the toolholder a 1/8-in. spacer is used between them. A height gage and precision gage block are employed to set up the toolblock, which is then inspected on a Jones & Lamson comparator at a 60:1 magnification. All toolblocks have the same dimension from the bottom of the block to the top of the cutting edge on the tools.

Two grinding fixtures simplify exact duplication of tools. The fixture for the crest tool has the slot placed to grind the cutting edge with the required taper of 1/32 in. per inch. Two 30-deg. flats on the second fixture aid grinding the 60-deg. included angle on the threading tool, and the tool slot is positioned properly to grind the 3 deg. side relief. By changing from one flat to the other, both angles and the side relief are ground.

The point of the threading tool has a 0.0052 in. flat. It is ground with a 320-grit diamond wheel or with a lapping disk, using No. 6 grade diamond dust and olive oil. Inspection is carried out with the J & L comparator at a 60:1 magnification.

Threaded bushings are inspected 100 percent, using two 0.001 in. dial indicators as shown. Experience shows less than one percent scrap when cutting the O.D. thread on an engine lathe with carbide-tipped tools

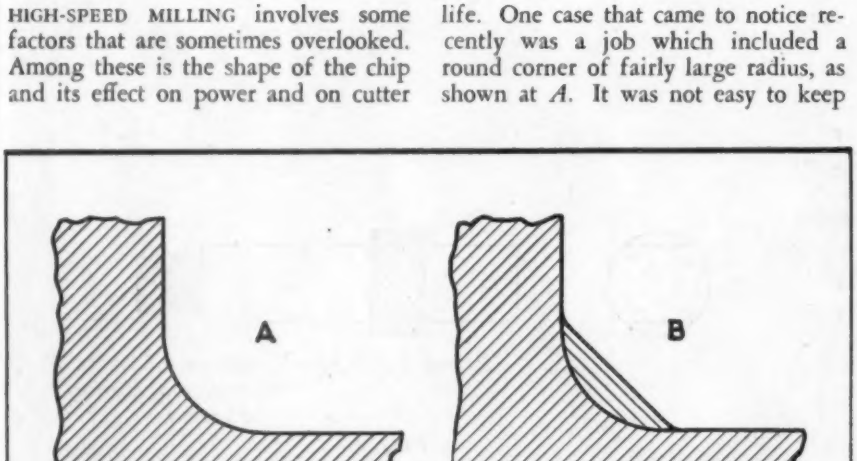
Bushings come to the lathe with the I.D. threaded. They are screwed on the arbor by placing the part between two radiused wood blocks held in a vise. After turning the external thread, the bushing is removed the same way.

The lathe is run at 392 r.p.m. with longitudinal feed controlled by a 16-pitch leadscrew. Three infeeds are made at 0.015 in. and a finishing cut at 0.0016 in. infeed. Coolant has a kerosene-oil base.

Shape of Chip Affects Heat Generated in Milling

FRANK C. HUDSON

HIGH-SPEED MILLING involves some factors that are sometimes overlooked. Among these is the shape of the chip and its effect on power and on cutter life. One case that came to notice recently was a job which included a round corner of fairly large radius, as shown at *A*. It was not easy to keep the cutter sharp. The chips got very hot and transmitted the heat to the cutter.



Two cuts as at *B* replaced the single cut at *A*

It was finally decided to divide the work into two cuts, making the first cut as at *B*. The second cut completed the desired radius. Cutters did not dull as quickly and both chip and cutters remained cooler. The theory as worked out by the toolmaker, was something like this.

The large radius of the cut forces the chip toward the center of the curve so that the friction of the chip particles on each other absorbs considerable work which means heat. By making the first cut without the radius as shown, the chip friction was reduced on the first cut. In the second cut which formed the curve, the chip was not confined by metal on either side and consequently was removed with less power and heat. This may be a point to consider in designing cutters for radius operations.

Fixtures Facilitate Assembly of Struts

ASSEMBLY of airplane landing-gear struts is made easier by a number of devices developed by the Axelson Manufacturing Company. This company has produced many thousand of these struts over the past two years.

One of the assembly fixtures is mounted on the side of a bench and consists of a backing plate upon which is swivelled the strut clamping arrangement. A pin on this holding device fits loosely into the pivot hole of the strut while the cylindrical body of the outer cylinder is held by a hinged and bolted strap formed to fit its outside diameter.

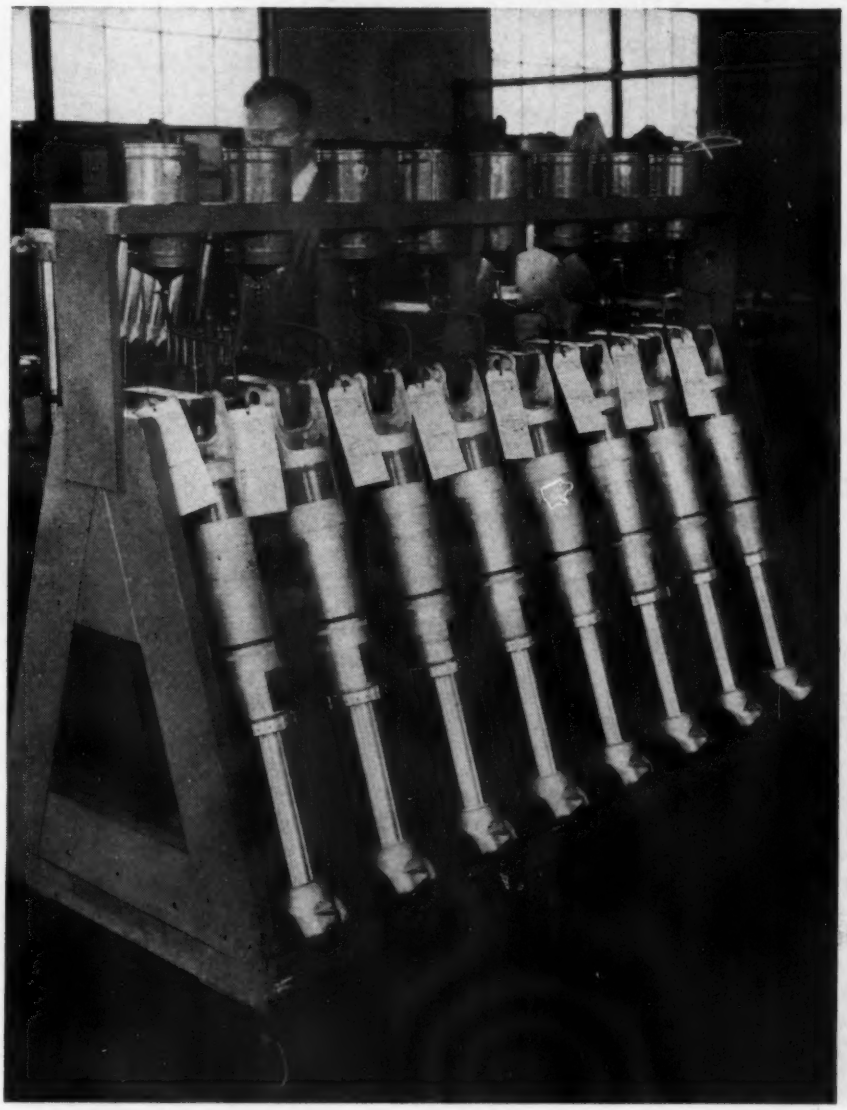
With the outer cylinder in this fixture, the piston head is drilled for a setscrew and then removed so the burrs can be cleaned away. The head is then reassembled to the piston rod and the entire strut is inverted in order to mount the inner cylinder. Because of the convenience of this fixture, the time required to fit these two parts is less than eight minutes.

Rack for Metering Oil

Next, the assembled struts are mounted on a wooden rack to be supplied with oil. The rack holds 16 struts, eight on a side being filled at one time. At the top are a number of containers graduated on the inside so that each will hold exactly 0.62 lb. of oil. The filler plug is removed from the strut and a copper pipe leading from the container is placed into this hole. When a petcock is opened, the oil drains into the strut cylinder by gravity.

In order to test the struts against leakage, 675 lb. of air pressure are applied and held for four hours. Bubble soap is applied to the top of the cylinder to indicate any escape of air. The hydraulic oil in the bottom of the cylinder is dyed red so that it will be apparent at once if any leakage occurs. This test pressure is considerably above that used in actual operation.

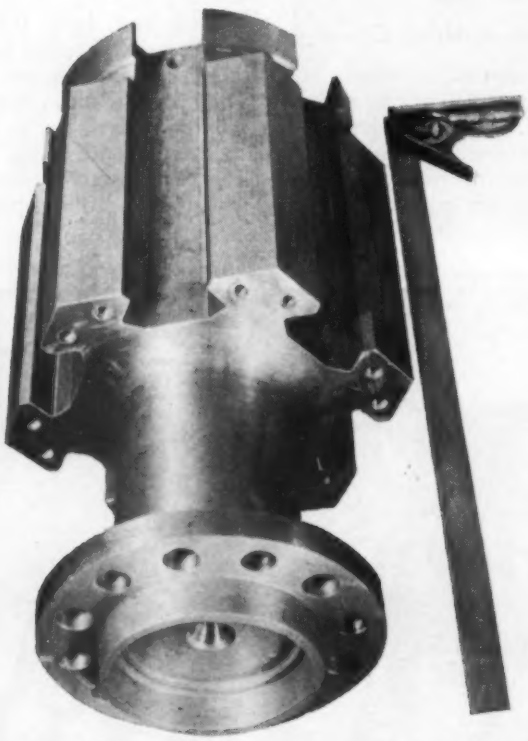
A simple pivoting fixture holds the strut during assembly. In practice the outer portion of the fixture is used in two positions 180 deg. apart and locked in place with a dowel pin. The strut is held by a pin through the pivot hole and a clamping strap



For testing the struts an exact amount of oil must be put into the cylinders. This filling stand provides a convenient way of adding the oil

Special Indexing Device Hastens Milling of Multi-Surface Slots

BY I. F. HUEY, TOOL SUPERVISOR, AND W. L. DONEY, MANUFACTURING ENGINEER,
TRANSPORTATION AND GENERATOR DIV., WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY



Dovetail grooves in this forged spider are rough and finish milled in one machine set-up through the use of a novel indexing fixture

Hexagon surfaces of the spiders are rough planed, four at a time, before going to the milling machine

Dovetail slots, formerly milled with special form cutters, are cut four at a time with plain milling cutters operating in gangs of eight in two set-ups

IN MACHINING large hexagonal spiders of forged steel, a production increase of 39 percent was achieved through use of a special indexing fixture for gang milling. Further savings were effected through elimination of the need for special form cutters.

Long established practice on this part was to rough and finish plane the hexagonal sides, by using an indexing plate; then transfer the workpiece to a milling machine and cut dovetail slots with rough and finishing form cutters. After completing the milling of six dovetails each in six spiders, the finishing form cutters were sufficiently undersize from repeated sharpenings, to be of value only as roughing cutters.

Longer Cutter Life

The new procedure of rough planing the hexagonal sides and finish milling the sides and entire slots does not involve excessively short cutter life, as repeated grinding does not prevent the continued use of inserted tooth milling cutters.

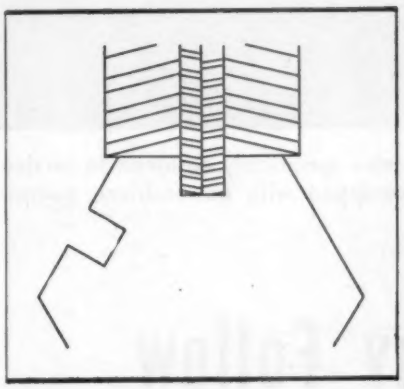
In rough planing the hexagonal sides, an indexing fixture, holding four spiders, is used. After planing, the four spiders are placed on one milling machine for finish milling the flats and rough and finish milling the dovetail slots. The milling fixture holds and indexes at one time the four spiders which are arranged in two rows of two spiders each.

Each row of spiders is gang milled by four cutters, two spiral cutters finish milling the flats and two keyway cutters rough milling the slots at

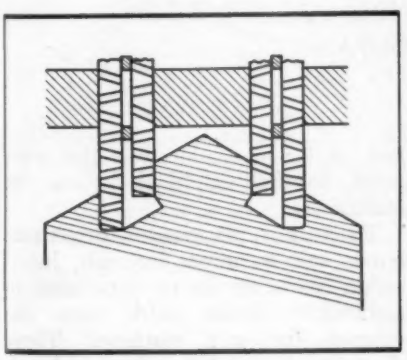
each indexing position. One arbor carries the eight cutters, the two groups being separated by spacing collars. At the completion of this operation, the operator removes the arbor and the cutters remain in place.

A second arbor is placed in the milling machine for the final milling. It carries eight keyway cutters in two groups of four to finish mill the slots. The two groups of cutters are separated on the arbor by spacing collars and proper distance between cutters in each group is provided by micrometer-stepped spacing collars.

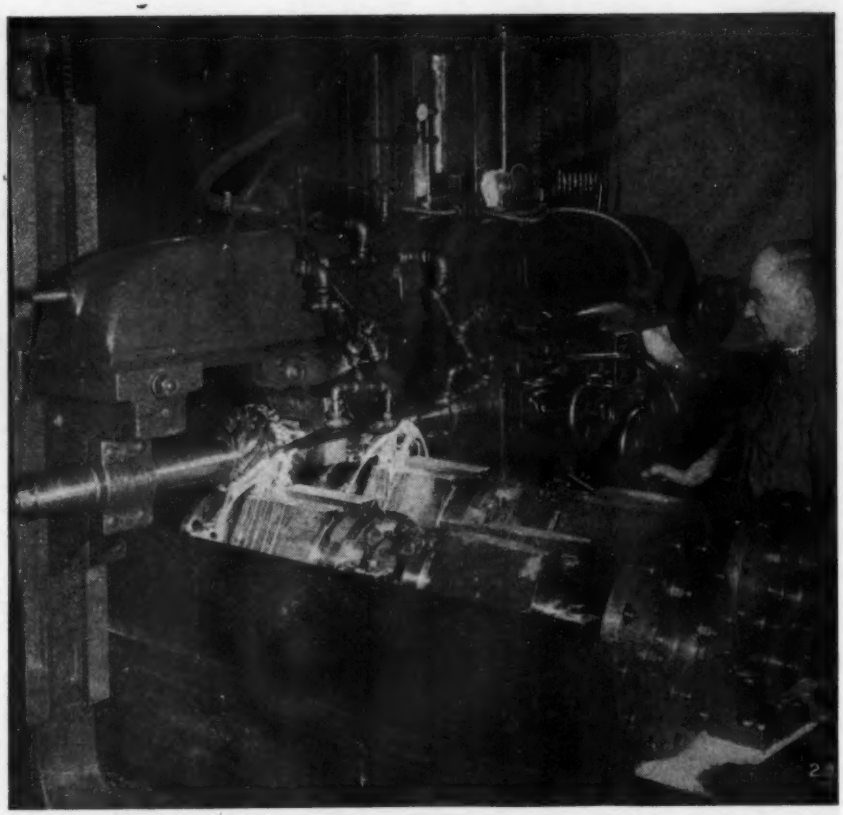
Two cutters are used for each slot, so four slots are milled simultaneously and, although each dovetail slot consists of seven flat surfaces, the multiple cutter arrangement makes possible machining all surfaces in one revolution of the indexing fixture. The step-by-step procedure in milling the slots is shown in the accompanying illustrations.



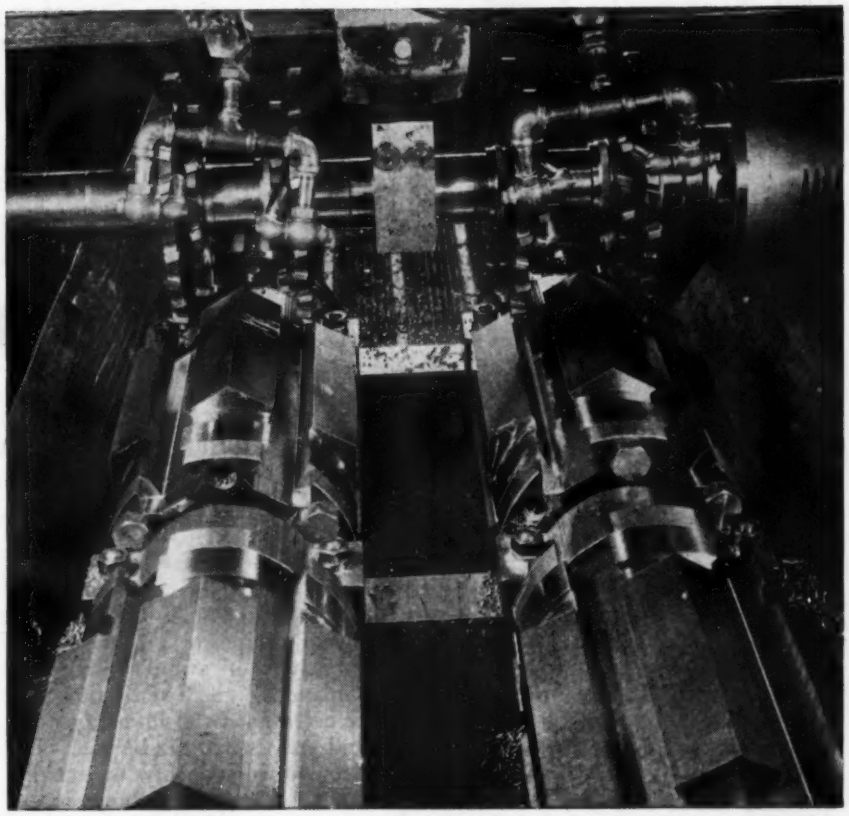
This cutter arrangement is used to finish mill the flats and rough mill dovetail slots. When this cut is finished the cutters are changed



The fixture is revolved counter clockwise to finish seven-surfaced slots in one revolution of the fixture



The special fixtures hold and index four spiders at one time. Here flats are finish milled and the slots rough milled. After this operation, the arbor is changed preparatory to finishing the slots



Arbors are changed in the milling machine, with cutters attached, when preparing to finish mill the slots

A "lube" cart, carrying six 100-lb. containers and pumps, is one piece of apparatus specifically designed to service machine tools. Small drums and tanks mounted on hand carts, and likewise equipped with power-driven pumps, dispense hydraulic oils and coolants

Machine Lubrication May Follow Automotive Service Methods

BY F. L. SCHAFENACHER, ASSISTANT SUPERINTENDENT, SUPERCHARGER DIVISION
FORT WAYNE WORKS, GENERAL ELECTRIC COMPANY

WHEN the Supercharger Plant of the General Electric Company was being tooled up, the management decided to establish a lubrication program that would minimize machine breakdowns arising from failure to provide the proper grade of oil or grease at required intervals. A tabulation was made of all types of machine tools and other equipment purchased, together with lubricants recommended by the builders. Then under the supervision of a lubrication engineer, a program was laid out and suitable dispensing equipment procured.

By analysis of manufacturers' recommendations, the lubrication engineer determined the fewest types of oils and greases that can be used without jeopardizing quality of maintenance. Obviously, economy results from purchasing the minimum number of types, because ordering, stocking and record-keeping are simplified. A list of vendors was also compiled, so that ample stocks can be maintained.

To insure application of correct materials and at proper intervals, lubrication charts similar to those used in automotive service work were developed for each machine. These charts are bound into reference handbooks issued to lubrication service men. Each chart gives a sketch of the machine indicating points to be lu-

bricated, the frequency of lubrication at each point, the quantity of lubricant to be applied, and any remarks necessary to carry out the instructions of the lubrication engineer.

Lubrication service men are assigned to specific sections of the factory. Their routine is determined by a book of log sheets, which are dated consecutively. The log sheet for a specific date is the work order for that day. If a given machine must be lubricated today, the operation is performed and checked off, and the next routine lubrication is entered on the appropriate daily log sheet. Similar operations on similar machines are grouped so that the work can be performed economically.

At the end of the shift, the service man's daily log sheet is sent to the lubrication engineer's office. Here a card record is kept of the lubrication history of each machine. This record has proved valuable in the case of machine breakdowns, as well as for lubrication studies.

Lubricants are stored in an oil house, smaller quantities are placed at vantage points throughout the plant. A special "lube" cart developed by the Alemite Company and General Electric carries lubricants and dispensing equipment to the machines.

Each lube cart carries six 100-lb. oil or grease containers and pumps. Dispensing hoses are 20 ft. long. An air hose 20 ft. long can be connected to outlets placed at convenient intervals throughout the plant. Thus, a machine 40 ft. from the nearest outlet can be serviced. Fittings used on the machines are similar to those employed on automobiles, except that some are equipped with measuring devices.

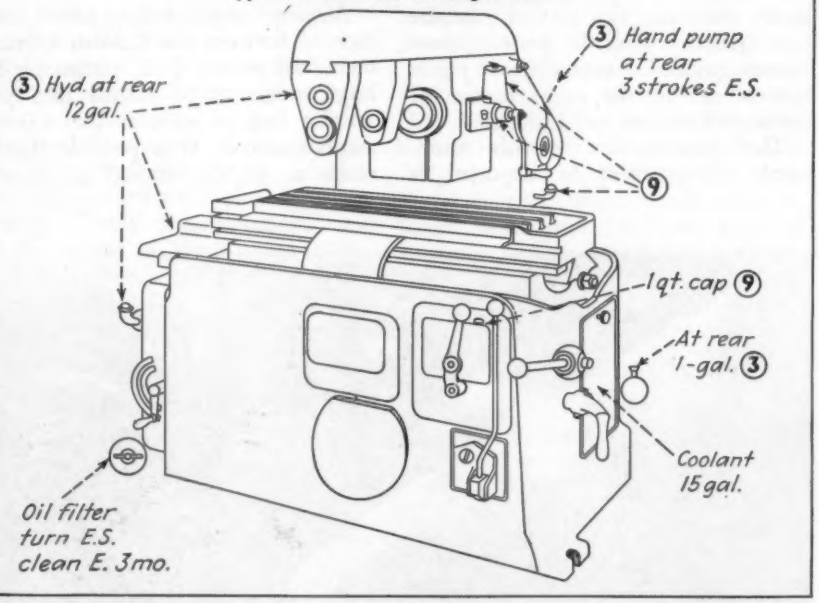
To round out the program, laboratory tests of lubricants are made at regular intervals.

LUBRICANTS STOCKED BY PLANT

Key No.	OILS	Viscosity at 100 F. Seconds
1	Very light spindle oil	65-70
2	Spindle oil	120
3	Spindle and light hydraulic oils	150
4	Medium engine oil	300
5	Heavy engine oil	500
6	Medium hydraulic oil	300
7	Heavy hydraulic oil	950
8	Compounded oil, light	300
9	Compounded oil, medium	950
10	Compounded oil, heavy	1950
11	SAE-80-EP—(sulphur-chlorinated)	600
12	SAE-90 heavy EP—(sulphurized)	900
	GREASES	
1G	Ball-bearing grease	High Temp.
2G	Pressure-gun grease	
3G	Water-resistant, No. 3 cup	

LUBRICATION GUIDE

Type of Machine: Milling Machine



Key No.	TYPE OF LUBRICANT: Viscosity at 100 F.	TYPE OF LUBRICANT: Description
3	150	Light hydraulic oil
9	950	Compounded oil, medium

FREQUENCY OF LUBRICATION

E.S.–Every Shift W–Weekly Mo.–Monthly

Hydraulic motor drive and coolant pump motor — Use 1G ball bearing grease every 3 months

Workhead — Has 4 grease fittings. Use 2G pressure-gun grease once a week

Hydraulic system — Change or filter every 6 months

New Designs

RECENT CHATS with some of our best known machine tool designers indicate improvement in their present machines rather than completely new designs, especially in the gadget class. Perhaps the topics discussed can be summed up under three headings: (1) bearings, (2) simplification, (3) rigidity. All three are most important and may well be studied carefully. To these may be added automatic controls if applied without undue complications. The latter have great possibilities but designers are also considering the effect on post-war employment. While all believe the increased output and the reduction in spoiled work will eventually add to employment in other lines, due to greater consumption, the transition period must be reckoned with. The engineer must make his new designs, but the business manager must decide the time and manner of putting them on the market.

Active Machinery Market Looms In Rebuilding Soviet Industries

BY SERGIUS D. BROOTZKOOS, MECHANICAL ENGINEER

Phenomenal resistance of Russia to the Axis is attributed in a large measure to removal of production plants to areas safe from aggression. Former industrial centers devastated by war will be reestablished as soon as feasible

THE INDUSTRIAL AWAKENING of the South Central Siberian and Eastern Turkestan regions of the Union of Soviet Socialist Republics, to which were moved the bulk of that nation's manufacturing facilities when invasion began, is worth watching as an indicator of the U.S.S.R.'s potential machinery and machine tool market.

There, behind the Urals, in a hitherto undeveloped region, exceptionally rich in natural resources, the Soviets deposited approximately 1,000,000 carloads of evacuated industrial equipment. Starting from scratch, they built brickyards, lumber mills, waterworks, power stations, houses for workers, schools for children, sewage systems, and then, the factories.

The industries moved en masse to the Urals stronghold represented between 60 and 70 percent of Russian industrial equipment of the invaded regions; the balance fell into enemy hands, and very little of it was left usable.

Reevacuation of these industries to Western Russia is made less likely by the "scientific" destruction of factory facilities by the Nazi hordes. Considering the shortage of manpower, materials, transportation facilities and other factors, the rebuilding of factories and homes would take many months. Wherever possible, demolished factory buildings are already being repaired and the machine tools salvaged. Makeshift plants, as a rule, are placed immediately to work on repairing war equipment or making spare parts for agricultural equipment.

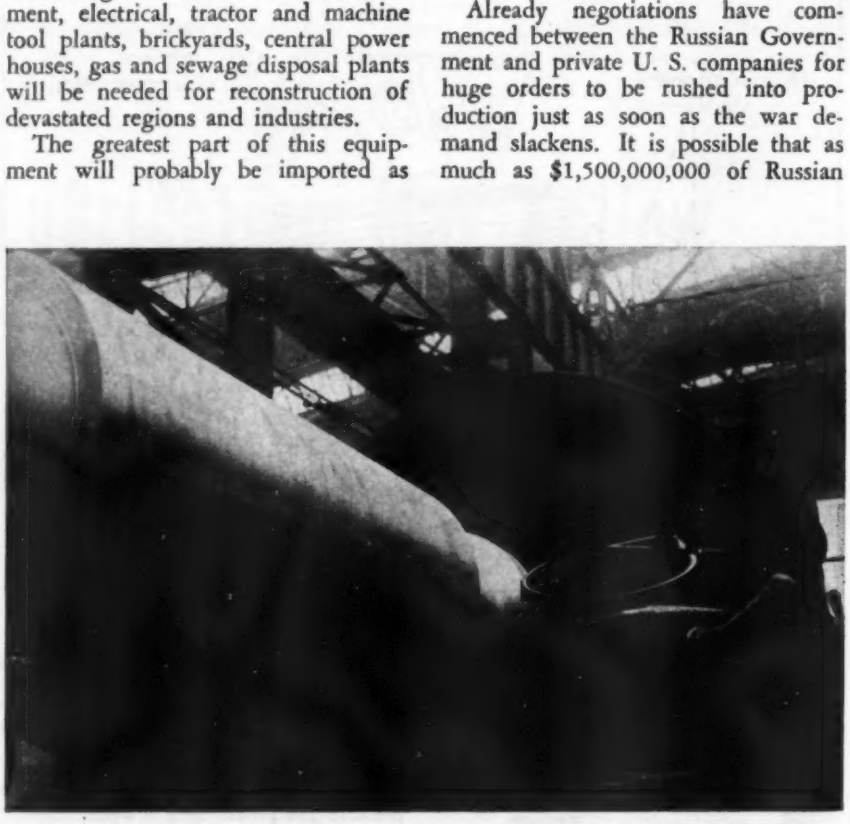
It seems likely that the newly created industrial plants in central Siberia and Turkestan will remain for a long time, perhaps permanently, and will continue to work with the machine tool equipment from the West. They represent too great an investment to be wasted.

Since neither the economical nor the political situation in Europe can be expected to be stable for several years to come, the Soviet Government is not going to disband its armament industry; it will, no doubt, be continued at a slower pace, or be placed partly on a stand-by basis. This indicates that an enormous amount of additional equipment for rebuilding mines and steel mills, cement, electrical, tractor and machine tool plants, brickyards, central power houses, gas and sewage disposal plants will be needed for reconstruction of devastated regions and industries.

The greatest part of this equipment will probably be imported as soon as the Black Sea ports are open for trade traffic. It will come from the United States and Great Britain because the Central European industries will be utterly destroyed by the Allied air forces. This opens great opportunities to those machine and equipment builders who will study this Soviet market and cultivate it with the view of using it for keeping their plants busy during the reconversion period of the American industries to peacetime requirements.

In spite of all the efforts of the Soviet Government to lessen the dependency of its industries on imported equipment, the latest available official census of machines shows that about half of the machines in their plants are of foreign make, imported after industrialization started.

Already negotiations have commenced between the Russian Government and private U. S. companies for huge orders to be rushed into production just as soon as the war demand slackens. It is possible that as much as $1,500,000,000 of Russian



A rolling mill shaft is machined in the mechanical shop of the Ural Machine Building Plant near Sverdlovsk, in the Urals. Establishment of such plants as this is attributed to successful evacuation of equipment from western Russia

business may be booked during the next six months, on the basis of privately financed credit.

Most exports to Soviet Russia will presumably consist of capital goods, such as machines, tools and equipment for reconstruction and rebuilding the industrial and economical life of the devastated regions. The possibilities for export to the U.S.S.R. of consumer goods will probably be limited to that required to alleviate the suffering of the population in the devastated regions, as well as to encourage to additional efforts the population in fighting the enemy.

Awards Show Industrialization

Rigorous censorship of the Soviet Press makes it difficult to gain any over-all estimate of the extent of the industrialization of the Urals. However, one may gain an intimation from the long lists of plants which have been granted "E" pennants, similar to those given in this country to companies which have performed meritorious work for the war effort.

In listing these "E" awards, neither the name of the plant nor the location and exact product is mentioned; only the number of the plant and the names of the men in charge are given. Identification numbers of these honor plants by the Commissariat under which each works often run into three figures. This alone denotes the extent of the mobilization of the country's resources.

Another illustration of the industrial effort of Soviet Russia can be found in announcements of new plants opening. These announcements reflect the extent of the Russian Government's success in evacuating plants to the rear of the country in the face of invasion by a ruthless enemy.

For example, in the last quarter of 1943 a new tank plant was placed in production in the Altai Mountain region of South Central Siberia; a new steel mill in the Southern Ural District and another in Central Turkestan; a new seamless tube mill and a new plant for building engine and turret lathes in the Central Ural District, and a new heavy machinery production plant in Eastern Turkestan. Newspapers and magazines also carry notices of installations of new blast furnaces, open hearth furnaces and other new facilities in plants in existence before the war.

Expansion of existing plants and the establishment of new factories can be attributed largely to the successful evacuation of equipment from invaded regions. The Russian machine building industry, which only started in 1930-1935, could not supply the necessary machine tool equipment and importation was restricted.

A Soviet munitions maker turns the nose of a shell. The latest available official equipment census shows about half the machines in Soviet plants are of foreign make, imported after the industrialization program started

Some announcements go so far as to say that a new plant was opened with equipment saved from the invader. The Altai tractor plant was built on the base of equipment evacuated from the Kharkoff tractor plant. In the announcement of the opening of a seamless tube mill in the Central Ural District, however, nothing was said of the origin of the "Stiefel" and "Pilger" mills installed; since these machines were never before built in Soviet Russia and could not then be imported, the conclusion can be drawn that they were evacuated from the Dnieper Dam region where several prewar tube mills were in operation.

Institute Planned Tools

Despite the fact that all Russian industries during the Five Year plans were built primarily for defense purposes, the war and especially the loss of Ukranian and White Russian industrial regions placed a tremendous burden on the remaining industrial facilities of the country. The burden placed on the whole production organism of the country can be gaged by the amount of work done in 1943 by the Experimental Scientific and Research Institute for Metal Cutting Machine Tools.

This Institute was organized before the war to plan new machine tool building plants, develop new machine tools, work out standards for machines and their parts, prepare production norms for metal cutting machines, adopt new methods and materials in the construction of new machine tools and perishable tools.

During 1943 the Institute designed, built, tested and placed in production: Low-swing simplified turret lathes for machining high-explosive shells and artillery cartridge cases; light and heavy broaching machines for sizing and rifling barrels for rifles, carbines and field artillery guns; vertical and horizontal boring mills for handling tank parts up to 11,000 lb.

Despite the exigencies of war, the Institute continues its scientific research work on electric drives and remote control of machine tools, on carburization and chrome cementation of machine parts and perishable tools, on stepless speed reducers and on standardization of machine tool elements and accessories.

Let us now see what has to be reconstructed and rebuilt in Soviet Russia after the havoc brought upon the country by the Nazi hordes.

Reconstruction work usually starts with rebuilding the communication system. The railroad system of Soviet Russia has a broader gage than that of Western Europe. In the occupied region the Germans changed this to suit their rolling stock, letting the captured Russian equipment go to waste. Unfortunately for the Russians, the greatest part of their locomotive building plants were located in these regions. Of all the locomotive building plants in existence there before the war, about 60 to 80 percent must now be rebuilt—several from the ground up. The railroad car building industry has suffered somewhat less

A majority of the relocated plants are in the South Central Siberian and Eastern Turkestan regions. Late in 1943 a new tank plant was placed in production in the Altai Mountains of the former region. Above, a typical scene on the assembly floor of a Soviet factory producing low silhouette tanks

because several new large car building plants had been erected in the last 10 years in the Ural and Western Siberia regions. However, from 40 to 60 percent of all car building facilities must still be reequipped. The large percentage figures of rolling equipment plants to be rebuilt and reequipped include plants in the Leningrad and Moscow regions which have been under prolonged bombardment.

Part of the reconstruction of communication facilities is the rebuilding of bridges and repairing of roads and buildings. About half of all plants which specialized in building and erecting bridges and in steel construction work, in general, were located in the invaded regions, and must therefore be reconstructed and reequipped. The same can be said about road building and construction machinery plants in these areas.

The automobile industry of Soviet Russia had its beginning about 15 years ago. At the start of the war it consisted of one huge plant in Moscow, another in Gorki, and of a truck plant in Yaroslavl. While these plants have never been in the hands of the enemy, they have nevertheless been subjected to severe air bombardments, and the amount of damages inflicted is still a military secret. Many of the damaged plants have already been reconstructed.

The Soviet tractor industry consisted of four plants: Stalingrad, Kharkov, Cheliabinsk and Leningrad (Putilov). The greatest part of the equipment of the Kharkov and Putilov plants was evacuated in time. The new Altai (Siberia) Tractor Plant, now in full production, is working with the equipment saved from the Kharkov plant. The Stalingrad Tractor Plant was utterly destroyed during the famous siege. There is no doubt that the Stalingrad and Kharkov plants will be rebuilt from the ground up, since they were supplying the most fertile regions of the country.

The automotive parts industry suffered more severely because many of its plants were located in the invaded regions.

The Agricultural machinery building plants of Soviet Russia were mostly located in the fertile black earth region north of the Black Sea. This region was in the hands of the Germans for about two years with the front line in a flux all the time, especially around the Kharkov and Rostov industrial regions.

The electro-technical industry was concentrated in the Moscow, Leningrad and Kharkov areas and suffered severely from the war ravages. The Kharkov electro-mechanical and turbine plants and the Taganrog high pressure steam boiler building plants may now be considered nonexistent; the same may be said of all plants specializing in building machinery for the sugar, alcohol, canning, chemical and mining industries which were located in the Ukraine.

Machine Tool Industry Rising

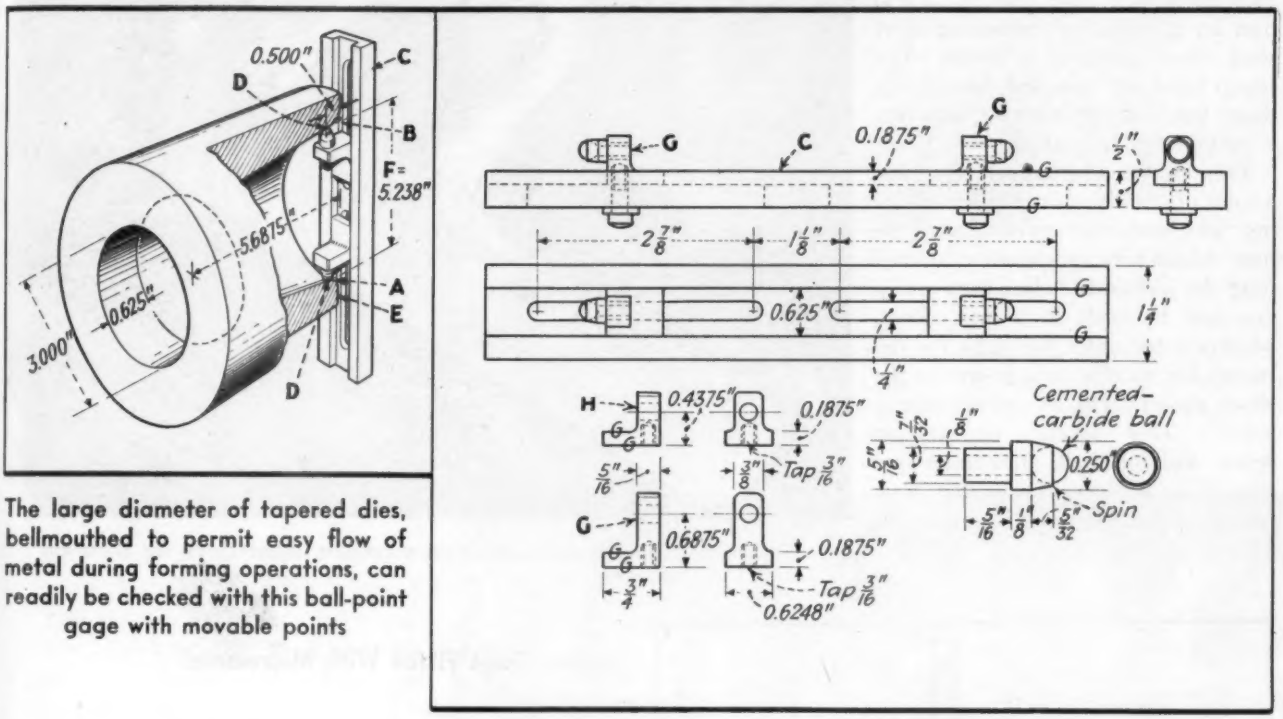
The Russians were succeeding fairly well in setting up their own machine building industry, and in 1937 the number of Russian-made machine tools reached a high level. The newly created machine tool building industry was located in the Moscow, Leningrad, Kharkov, Central Volga and Ural regions where skilled labor was available. Only a small majority of these plants fell into the hands of the enemy: The Kharkov plant of drill presses, the Kiev plant of automatic lathes, the Odessa plant of threading machines, the Kerch plant of can-making machines and several other lesser size plants. The machine tool building plants in Moscow and Leningrad have probably suffered some damage from bombardment.

The heavy machinery building industry, however, was hit harder, since the few old prerevolution plants were all located in the Leningrad, Kharkov and Donbas regions. The following plants are known to be damaged or destroyed by the Germans: Izhorsky, Gorlovka, Taganrog Hydropress and two Kramatorsky plants.

Since the Russian machine building industry was unable even before the war to satisfy the demand of their industries for the replacement of worn and for new, more efficient machines, the U.S.S.R. will now be forced to resort to the importation of new industrial equipment on a large scale in order to restore the industrial and economic life in the devastated regions. With the German competition out of existence British and American machine builders may expect very lucrative business, provided their methods of approach, of financing, and of general engineering service are handled properly.

Practical Ideas

War-Winning Suggestions appearing on these pages were selected from those recognized as meritorious by the Board for Individual Awards, War Production Drive. They are freely offered to industry as an aid to war production



The large diameter of tapered dies, bellmouthed to permit easy flow of metal during forming operations, can readily be checked with this ball-point gage with movable points

Gage Checks Diameter of Bellmouthed Dies

BY J. H. KAUTSKY

Dodge Plant, Link-Belt Company

During the past year we have made many large forming dies with tapered bores ranging from 4 to 15 in. diameter. The large diameter of the bore is bellmouthed to permit easy flow of metal during the forming operation. When machining the bore of these dies, the operator was able to measure the mouth of the bore before he cut out the stock as shown at *A*. It was not necessary to measure closer than plus or minus 0.002 in. because grinding stock was left in the bore. The dies are hardened, and then ground to close tolerances.

With point *B* removed during the machining operation, it became a problem for the grinding machine operator to measure the tapered bore at the large end. This was solved by making ball-point gage *C*.

It is necessary on the particular die shown in the drawing to calculate the diameter at point *D* where the 0.250 in. diameter balls will touch the bore when the center of the balls are mounted exactly 0.500 in. from the face of the gage bar. The gage is then set with precision blocks to this diameter, and is used like inside calipers. When the balls touch the bore, and the face of the gage bar touches the face of the die at *E*, the desired diameter has been attained. It is obvious that in the meantime the machine has ground the die to the correct angle or the desired degree of taper. Dimension *F* shows the diameter of the die before stock removal by grinding.

For the particular gage shown in the drawing, the pair of ball supports *G* were used with the gage bar because they locate the centers of the balls 0.500 in. from the face of the gage bar. Supports *H* are used to measure 0.250 in. from the face of the bar. It is only necessary to make more supports for jobs requiring measurement deeper into the bore. Larger jobs would, of course, require a larger gage bar. By reversing the balls, this gage can be used to measure outside diameters. Also, it has proved useful on jobs that are not tapered.

This gage is accurate, easy to set, sturdy and inexpensive to make. It can be made in several sizes to be used in the measurement of a large range of sizes. A variation can also be made to measure depths of recesses in large bores. For this, the ball support is made with a shank that holds the ball in such a way that it can be moved back and forth rather freely. In this case, a dial indicator is attached to the face bar for the movable gage point to work against.

PRACTICAL IDEAS

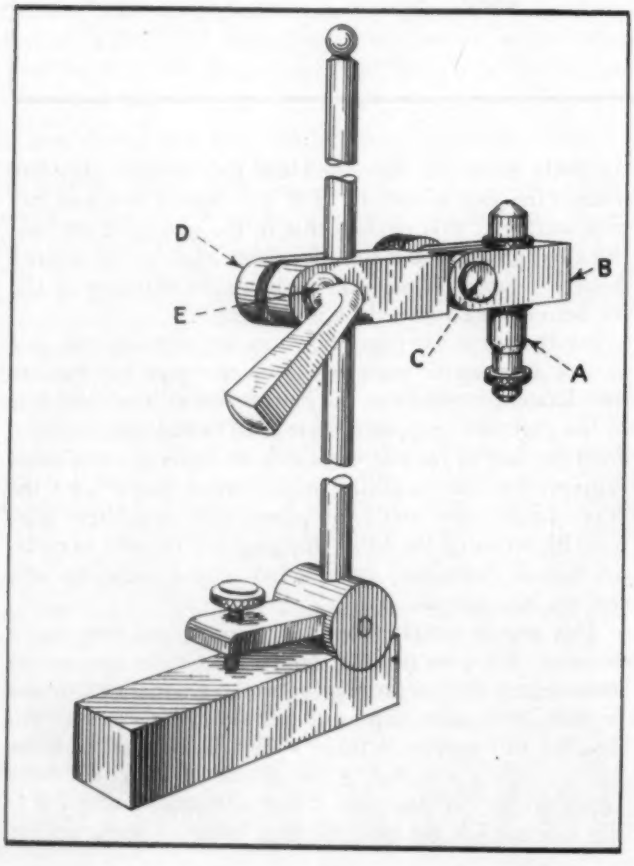
Layout Table Simplifies Cutting of Aluminum Sheet

BY DON R. ROUSH
Northrop Aircraft, Incorporated

The illustrated table was designed to speed the shearing of aluminum sheet required for airplane nacelle skins. Holes are drilled in the table top, and bushings are pressed in the drill holes to receive pins *A*. These pins act as stops for positioning sheet stock when cutting it to length. The set-up holes are stenciled, identifying those holes which must be used for a particular skin section.

Prior to the adoption of this table a total of 25 different cell skin-shearing jobs required approximately 30 min. set-up time preparatory to running the individual jobs. Each set-up can now be made in 5 min. Thus, when a work order for skins for the twenty-five nacelle units is sent to the shop, almost 10½ hr. set-up time is saved. This saving amounts to seven and one-half man-hours per day. *War Winning Suggestion from the Board for Individual Awards, War Production Drive.*

Pins inserted in this table position aluminum sheet stock for shearing



Surface Gage Fitted With Micrometer

BY DANIEL E. McDONALD

Several parts for one of the items made in our shop have to be placed on a surface plate for inspection. Extreme accuracy was not demanded on the these parts, but certain tolerances had to be held. To facilitate inspection, we fitted an inside micrometer head to a surface gage as shown in the drawing.

Micrometer head *A* is slipped into holding fixture *B* and is clamped in any desired position by tightening a knurled nut. Clamp *D* slides on the surface gage rod, and is secured by tightening lever arm *E*. Holding fixture *B* swivels about screw *C;* therefore, adjustment of the micrometer head can be made with the surface gage rod in any position. Standard inside micrometer rod can be used with the micrometer head to increase the range and usefulness of this tool.

•

An inside micrometer head clamped to a surface gage is suitable for measurements where tolerances are liberal. The micrometer head can be swiveled to take measurements in any direction

Chain and Sprocket Drives for Tumbling Barrels

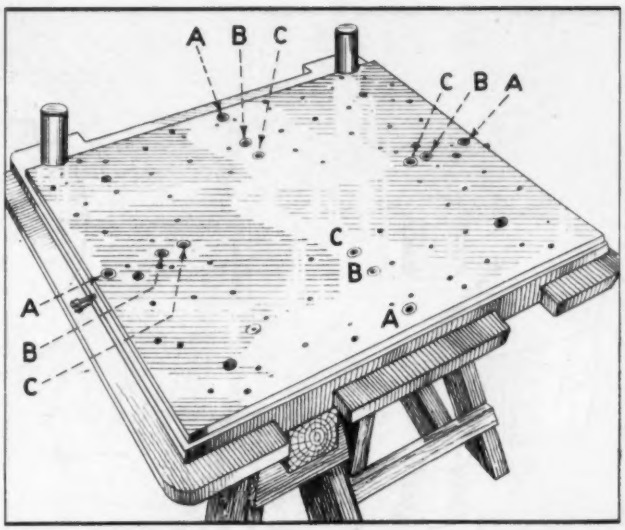
BY JOHN F. CAVANAGH

V-belt drives on two tumbling barrels, one heavy and one light, required frequent renewals, sometimes at inopportune moments, so it was decided to try a different type of drive. Use of chains and sprockets, with some form of slip clutch or absorption spring to take care of heavy starting torque, seemed to be the logical substitution. Chains and sprockets were readily available, but slip clutches and torsion springs were not, so a standard Bendix spring was used to connect the sprocket to the motor shaft on the light tumbler. On the large unit, a heavy torsion spring taken from a large-size door check serves a similar purpose.

One Die Shoe for Several Sizes of Dies

BY LESTER W. MITCHELL
Curtiss-Wright Corporation, Airplane Division

Die shoes can be reworked so that several different sizes of dies can be used on the same punch press without changing the die shoe for each operation. The die shoe illustrated was originally intended for one size die and the mating holes *A* drilled in the plate. This shoe is now drilled to hold additional sizes of dies, holes *B* and *C* being provided for this purpose. The adoption of this idea saves at least forty minutes in every change of set-up. *War Winning Suggestion from the Board for Individual Awards, War Production Drive.*



This one die shoe is used for three sizes of dies. Holes for each die are identified *A*, *B* and *C*

Emergency Milling on a Lathe

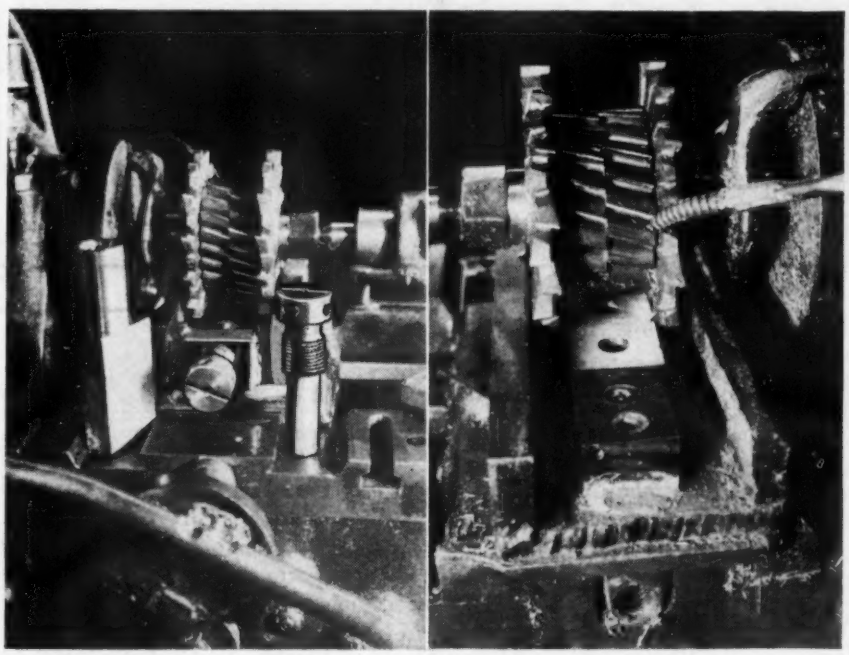
BY A. R. BAKER
Pilot Instrument Company

Our shop recently contracted to machine a large quantity of bronze lugs used as terminal ends for large diameter electric power cables. Castings were received in the rough and we were to bore and turn the shank, and mill four sides.

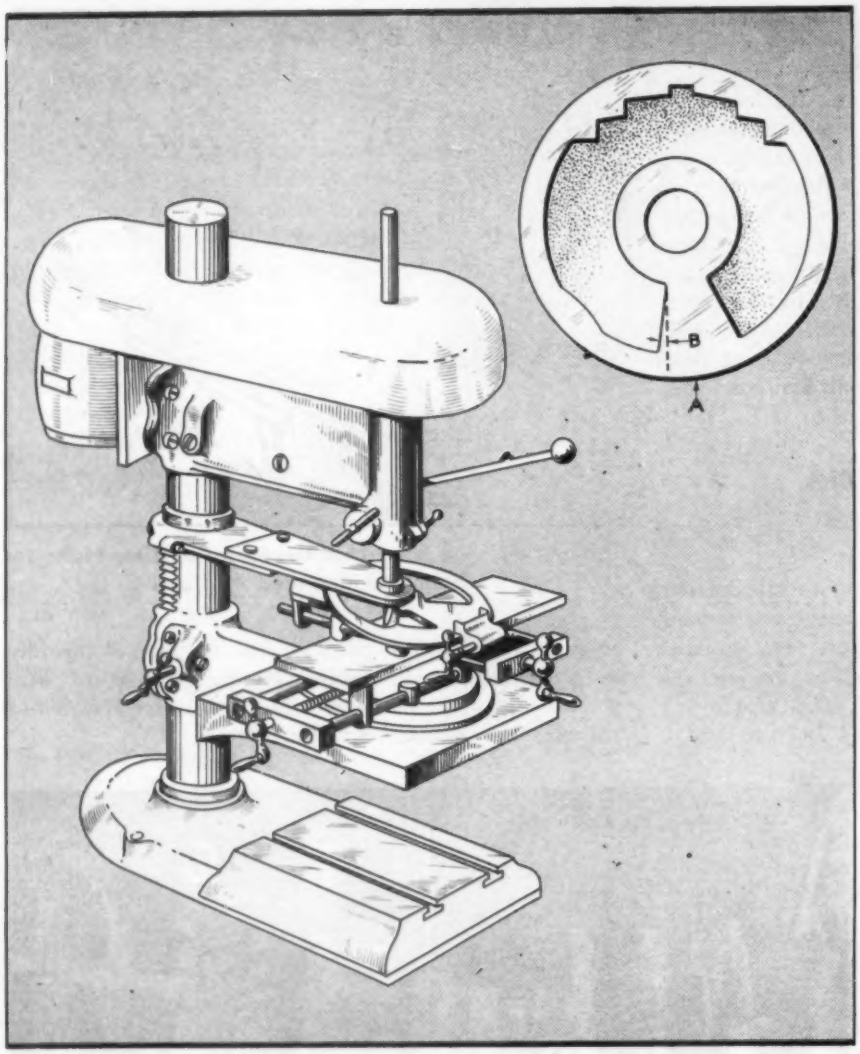
When taking on this job it was with the belief that a heavy-duty milling machine would be available, but production was required before the machine arrived. To accomplish this, we used an old Willard lathe to mill three sides, using two side milling cutters spaced by a slab milling cutter.

The lathe compound was removed to make room for the milling jig, which was made from heavy steel plate and bolted and pinned to the cross-slide. A block in the rear of the jig had two hardened and sharpened pins which bit into one end of the lug. On the other end of the jig was a tapped block welded to the jig. A screw was inserted through this block into the bored shank of the lug and tightened to force the lug against the rear pins. As the castings were rough, except for turned and bored sections, previously finished on another lathe, alignment for squareness had to be by eye.

The handwheel for the cross-feed screw was replaced by an 18-in. crank, as the feed required for this cut was too heavy for the power cross-feed. Shims under the jig took care of the loss of diameter of cutters through resharpenings. Cutters were mounted on an arbor held between two centers on the lathe and driven by a dog, but the driver plate had to be fastened by setscrews so the lathe could be operated in reverse.



This lathe set-up made it possible to mill three sides of a heavy bronze lug, when no milling machine was available. Shown are the front (left) and rear views of the fixture employed



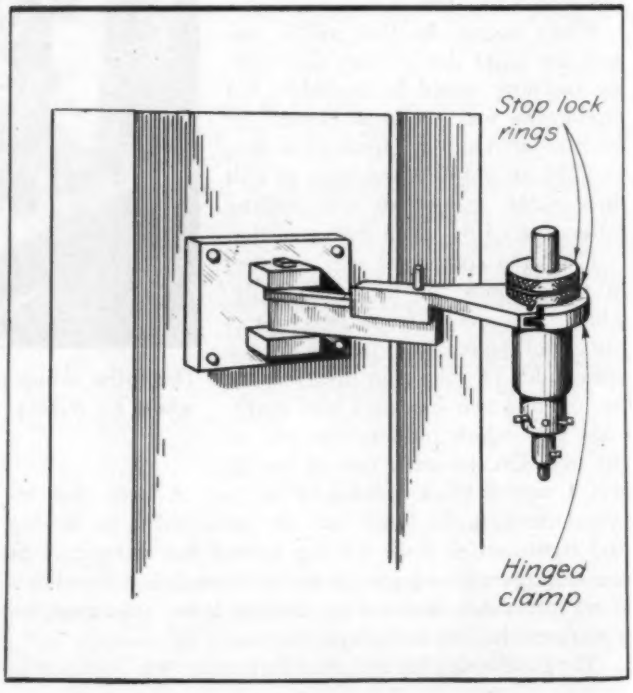
Drill press with special fixture to machine cams for 0.38-cal. guns. The jig can be used to cut angles and any radius required. Insert shows a typical cam, the shaded area representing the area to be machined

Machining Cams On a Drill Press

BY H. G. CONSTANTINE, JR.
Gulf Shipbuilding Corporation

An inexpensive, accurate method of milling 5-in. firing cams *A* for 0.38-cal. guns has been devised in our plant. This job is done with a special jig we designed and built. It is mounted on the drill press table and consists of a holding fixture mounted on cross- and longitudinal-slides. Angles such as *B* can be cut by moving the two horizontal feed screws, which turn worms and worm gears. This circular feed and adjustment also makes it possible to cut any radius in the cam. Vertical adjustment of the drill press spindle controls depth of cut.

Each cam that is cut differs, slightly, from those previously made, due to variance in gun locations on shipboard, so it is not satisfactory to machine the cams from one standard pattern. *War Winning Suggestion from the Board for Individual Awards, War Production Board.*



This swinging arm, with hinged clamp, facilitates changing a heavy boring bar that is held in a magic chuck. One man now does this, where two formerly were required

Boring Bar Holding Arm

BY HAROLD STALER
Packard Motor Car Company

Handling a boring bar, weighing about 70 lb., normally required two men to hold the bar and release the magic chuck when changing tools for subsequent operations. This was partially due to the size of machine table and fixture, which placed the bar at arm's length when the operator stands in normal position. A swinging arm, as illustrated, was fastened to the machine column. When the first boring and facing operations are completed, the arm is swung into position and the clamp fastened around the tool. The magic chuck is then released and a new tool inserted, all by a single operator. In addition to reducing tool changing time, damage to toolbits, which formerly resulted from laying the tool on the machine table, is eliminated. *War Winning Suggestion from the Board for Individual Awards, War Production Drive.*

Radius Forming Tool Cuts Concave And Convex Surfaces

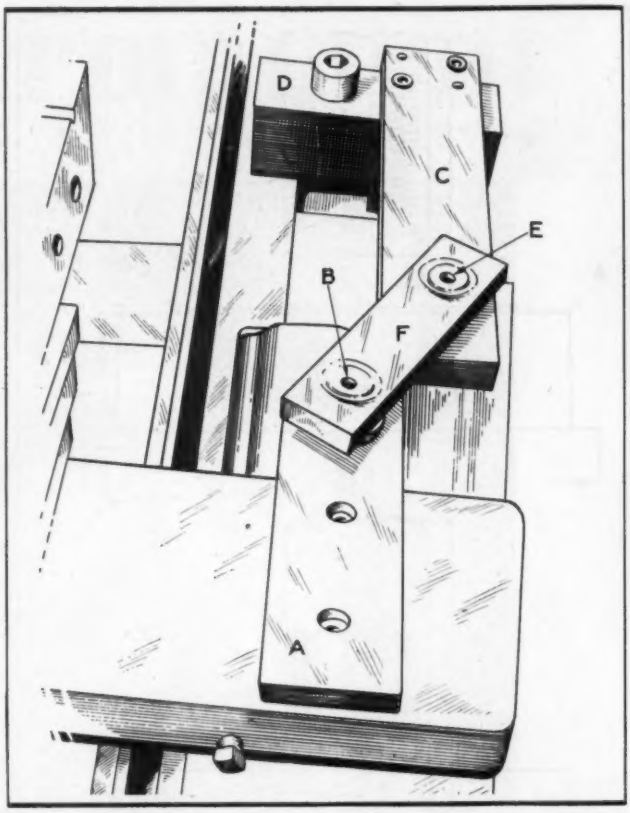
BY ARTHUR K. BAKER

The drawing shows a device used for turning either concave or convex radii. Plate *A* press fitted with pin *B* is bolted and doweled on the rear of the cross slide on a small engine lathe. Plate *C* is pinned and bolted to block *D*, which in turn is bolted to the rear lathe way. Pin *E*, press fitted in plate *C*, is the same diameter and height as pin *B*. Connecting link *F* is made with two holes jig bored at a center distance exactly equal to the radius to be machined. This link is a push fit on pins *B* and *E*.

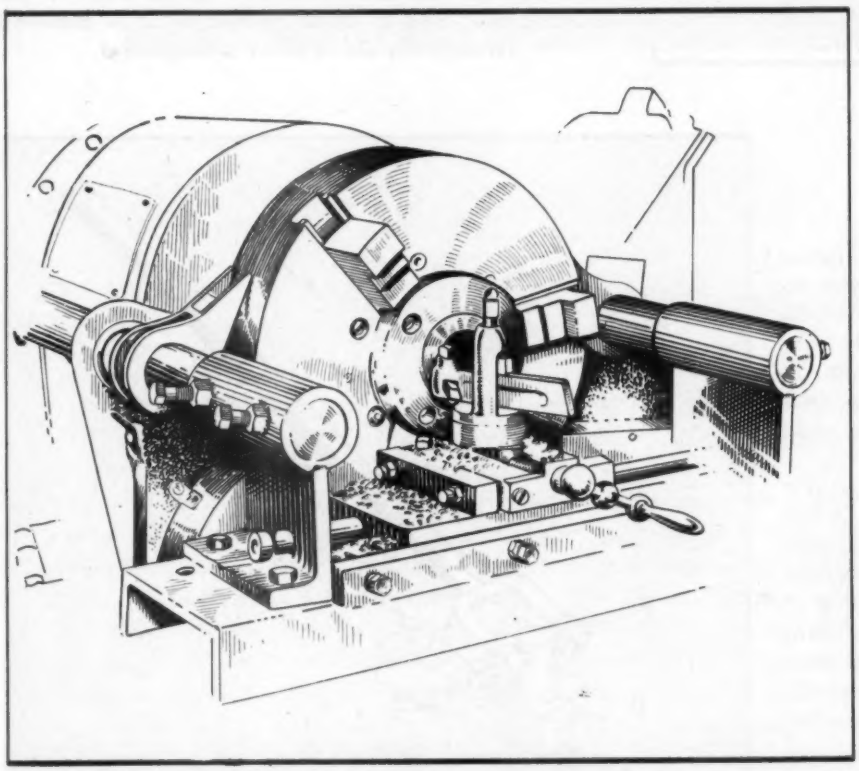
Before machining, the compound rest on the lathe carriage is set up 90 deg. for lateral movement of the toolbit, which is mounted in the toolpost in the usual manner. With the assembly fastened down, the carriage loose, and link *F* in place, crosswise movement of the carriage will simultaneously move the carriage along the ways. Thus, the toolbit will travel in an arc, since link *F* pivots on pin *E* fixed to the lathe bed. The radius of the machined arc can be varied by increasing or decreasing the length of link *F*.

When the link, block *D* and plate *C* are mounted on the right of the lathe carriage, the tool will cut a concave surface on the work held in the lathe chuck. When the assembly is set up to the left of the lathe carriage, the tool will cut an exactly mating convex surface.

This tool was designed to machine optical laps, on which mating convex and concave surfaces were required.



Mating concave and convex surfaces can be machined with this linkage between the lathe carriage and the bed



This inexpensive fixture fits a Toledo pipe threading machine to convert it for simple lathe operations, such as might be needed on pipe

Lathe Attachment For Pipe Threading Machine

BY FRANK COOPER
AND FRANK MACK
Marinship Corporation

A simple lathe attachment, costing about $75, can be made for a Toledo pipe threading machine to adapt it to facing and beveling pipe. The attachment consists of a bedplate with a pair of sleeve supports that slide on the parallel bars on either side of the back chuck of the machine. A tool carrier is mounted on the bedplate and can be moved across the face of work held in the chuck. Besides making both ends of the machine workable units, this device saves considerable time formerly required to take work from the threading machine and set it up in a lathe. In addition to reducing by about 60 percent the time required to perform several operations, the use of this fixture overcomes the tying up of a lathe that could well be utilized for other work. *War Winning Suggestion from the Board for Individual Awards, War Production Drive.*

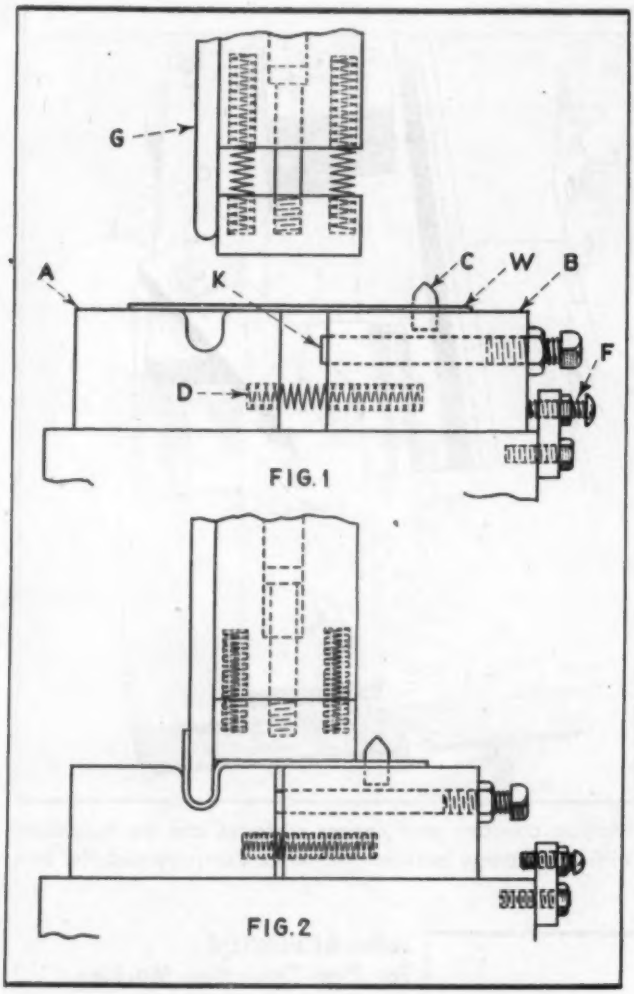


FIG. 1

FIG. 2

Controlling Accuracy of Formed Stampings

BY L. KASPER

In forming a stamping, it was necessary to locate from a hole in the stamping in order to control accuracy. Locating from a fixed pin often resulted in the stamping being torn, as it was necessary for the blank to be free to draw from both ends. A die construction which permits the blank to draw, maintain accuracy and prevent tears is shown in the accompanying illustration.

Fig. 1 shows blank *W* located on pin *C*, which is carried on block *B*. Die block *A* is grooved for the forming operation, provided through punch *G*. Block *A* is in a fixed position while block *B* is free to slide. In positioning a blank, block *B* is forced against screw *F* by spring *D*. Block *B* also carries a screw which adjusts pin *K*. A spring pad for holding the blank flat is carried on the punch holder.

When the press ram descends, as shown in Fig. 2, the spring block holds the blank flat on both blocks, while the punch forces the blank into the groove for forming. The forming action causes the blank to be shortened from both ends, and as one end is fastened to pin *C*, block *B* is drawn toward the stationary block against the resistance of spring *D*. Just before the extreme lower position of the ram is reached, pin *K* contacts block *A* and halts movement of the sliding block. When this sliding movement is halted the blank stretches slightly, but as the final position of the pin *C* is controlled by the contact between pin *K* and the stationary block, uniformity in the dimension between the formed section and the hole is assured.

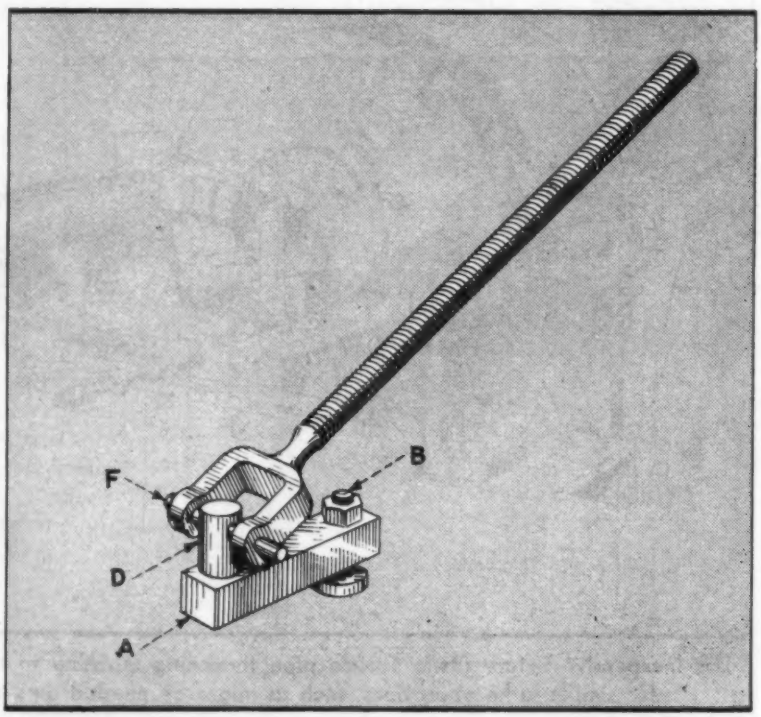
Uniformity in the dimension between a hole in the stamped part and a shape formed in it is achieved through this sliding block arrangement

Equalizing Fixture For Threading Forked Rods

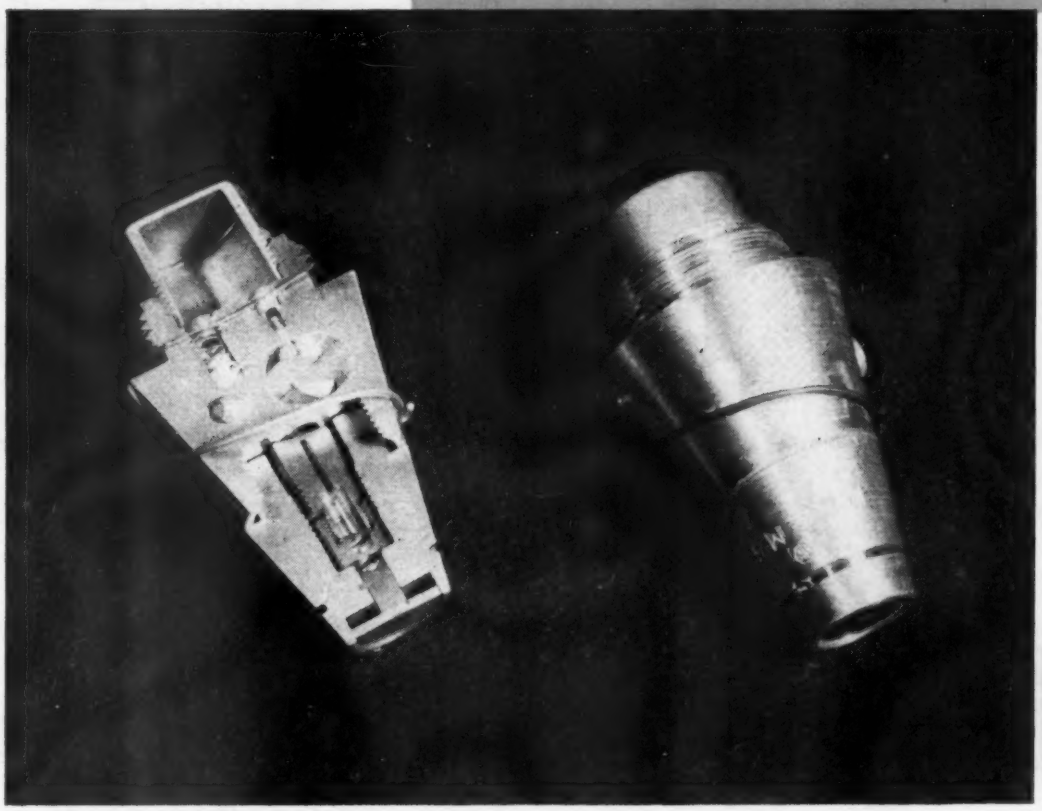
BY D. A. BAKER

Recently we had a large quantity of forked rods, which were to be threaded. We were doing this with a self-opening die head in a lathe chuck, but ran into some difficulty, as the parts were rough castings and were not uniform. To simplify the job, an equalizing fixture was developed so the die could follow more easily the diameter to be threaded.

The equalizing fixture consists of a cast iron block *A* with a bolt hole drilled at *B*. A bolt through *B* holds the fixture on the lathe compound slide, in place of the regular tool holder. Inserted in a reamed hole is shoulder stud *D*, through which a hole was drilled. In drilling this hole, the drill was held in the lathe chuck so the hole would be true with the lathe spindle. Stud *D* is free to turn in the block as required.



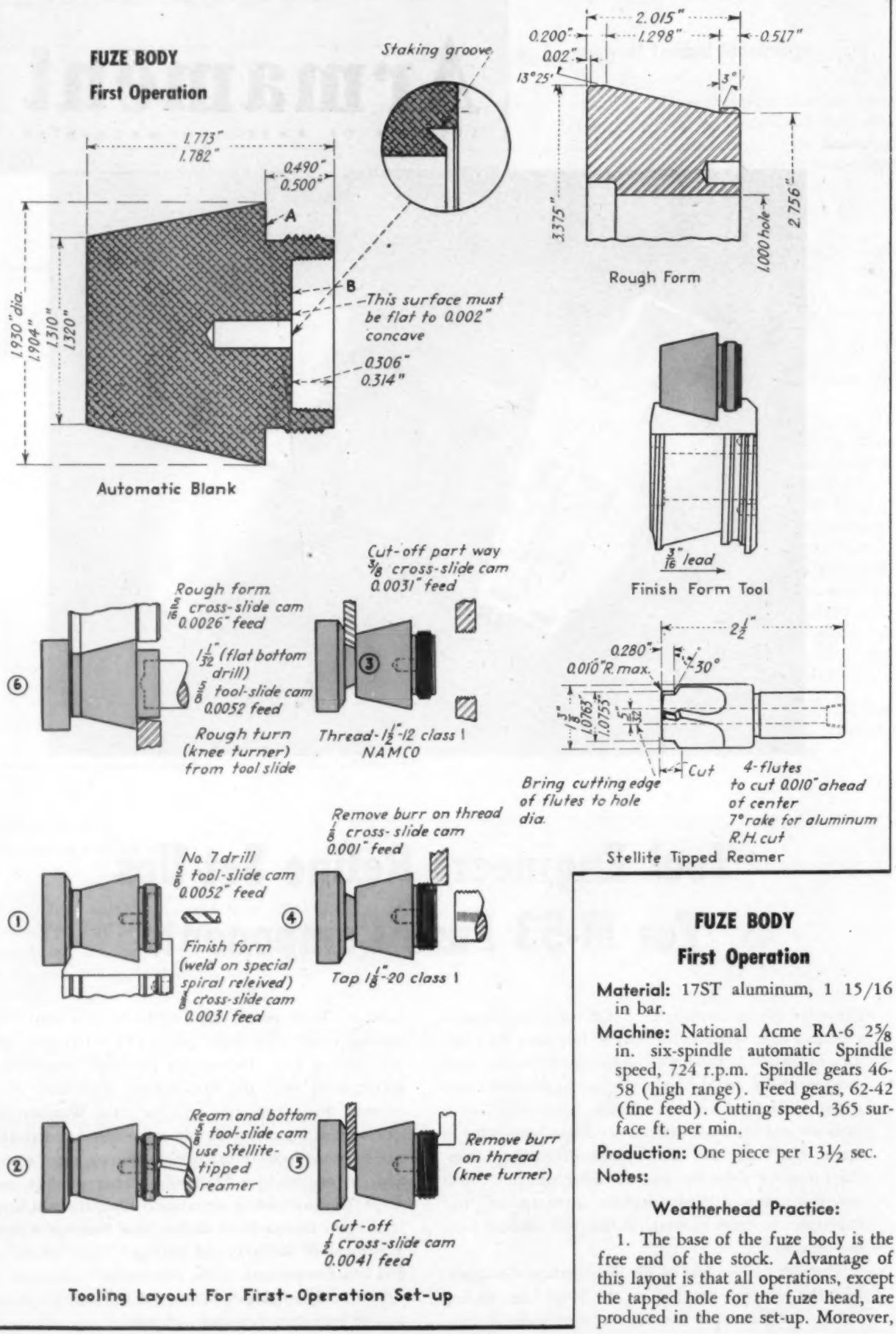
Threading of forked rods is made easier with this simple aligning fixture



Tool Engineers Refine Set-Ups For M-53 Fuze Components

Expanded procurement by U. S. Ordnance has brought a number of new contractors face to face with the problems incidental to producing aluminum, brass and steel components of the M-53 mortar fuze to required tolerances, finish and volume. Taken individually, fuze parts are not the most difficult screw-machine items to make. But under the circumstances of military necessity for quick deliveries and the labor situation, these new contractors will wish to take advantage of prior experience in order to establish the most efficient tooling set-ups.

Through the courtesy of the Weatherhead Company, long the principal producer of the M-53 fuze, tooling layouts are presented for the six most difficult components. These pieces are: (1) body, (2) head, (3) housing delay, (4) slider plug, (5) safety pin, and (6) locking pin. The layouts represent considerable development since the first tooling suggestions were received three years ago. At that time Weatherhead tool designers and production men introduced certain modifications looking toward performing more operations in one set-up, obtaining a better product, and simplifying succeeding operations. Over the past three years many thousands of dollars have been spent upon refinement of methods and tooling. These efforts reflect broad experience in the commercial production of screw-machine products before the war and the intention of producing fuze parts efficiently.



Tooling Layout For First-Operation Set-up

FUZE BODY

First Operation

Material: 17ST aluminum, 1 15/16 in bar.

Machine: National Acme RA-6 2⅝ in. six-spindle automatic Spindle speed, 724 r.p.m. Spindle gears 46-58 (high range). Feed gears, 62-42 (fine feed). Cutting speed, 365 surface ft. per min.

Production: One piece per 13½ sec.

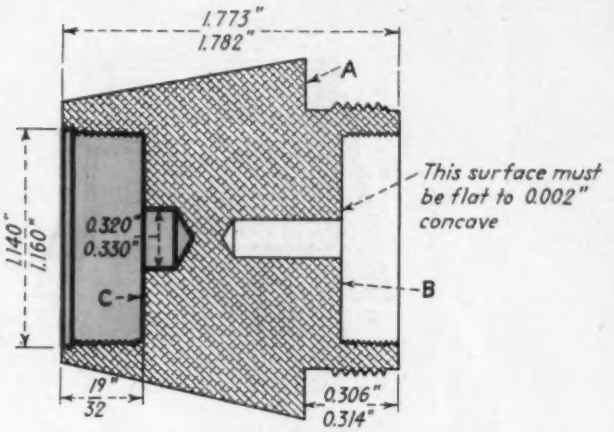
Notes:

Weatherhead Practice:

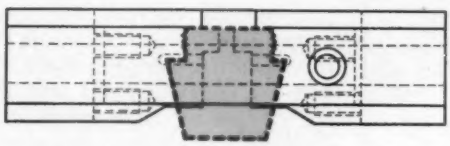
1. The base of the fuze body is the free end of the stock. Advantage of this layout is that all operations, except the tapped hole for the fuze head, are produced in the one set-up. Moreover,

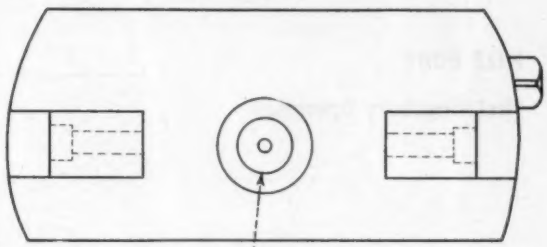
FUZE BODY

Second Operation

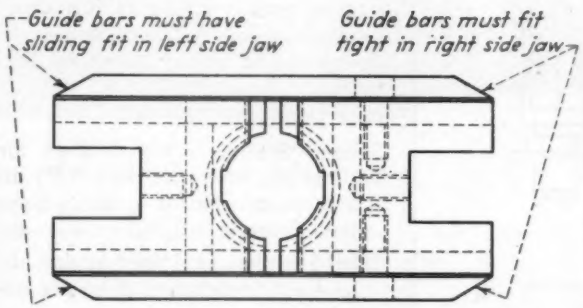


Second-Operation Component

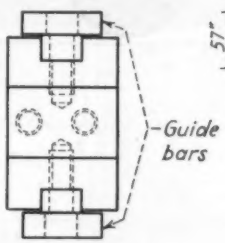


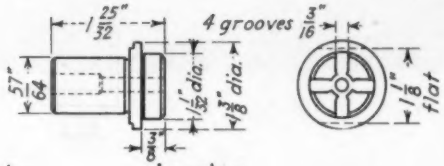


Chuck with Locator in Position

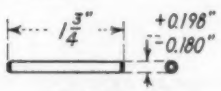


Chuck Jaw with Guides





Locator



Pilot Pin

better concentricity is obtained. The bar is held in the collet until all operations required to form the body and machine one end of the part are completed.

2. Difficulty was originally experienced in obtaining necessary smoothness of shoulder *A*. A carbide overall form tool did not work to complete satisfaction, its cost was high, and the tool was considered too fragile to place in the hands of inexperienced operators. The Weldon Tool Company supplied a high-speed steel form tool ground with a spiral relief that gives sufficient side clearance to promote a smooth finish on the shoulder.

3. The bottom of the counterbore *B* must be flat to 0.002 in. concave. Reamers naturally wear first at the corners, then produce a wavy contour that will not be passed by inspectors. High-speed steel reamers gave 20 hours of service. Now a Stellite-tipped reamer gives 150 hr. production without attention.

4. The staking groove in surface *B* was transferred to a drill press to reduce complication of the first-operation set-up.

Second Operation

Machine: Goss & deLeeuw 4-spindle chucking machine.

Operation: To machine the 1⅛ in.-20 tapped end of the part; drill 1 1/32 in. hole, drill 5/16 in. hole, ream 0.320-0.330 in. hole, and tap 1⅛-20 thread.

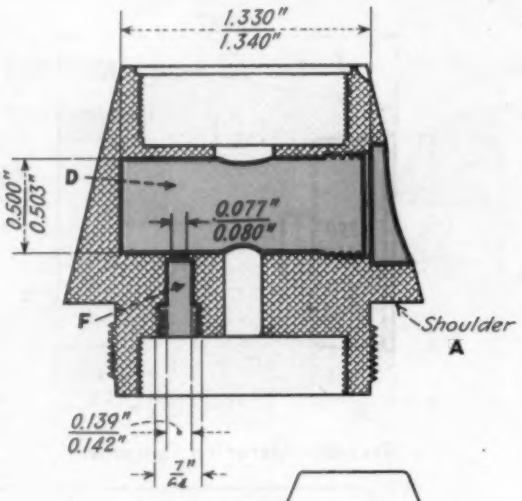
Production: One piece in 9 sec.

Notes:

1. Faster production, greater accuracy and less trouble over considerable periods are experienced by putting this operation on the chucking machine, rather than a drilling machine.

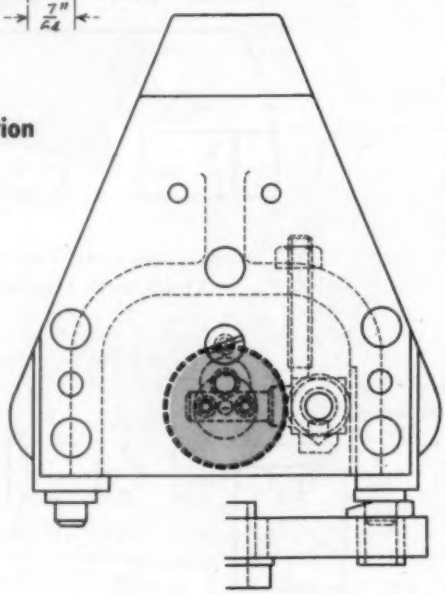
2. Chucks are fitted to locate the piece accurately and minimize wear. To avoid the tendency of the jaws to bellmouth after considerable use, the jaws are "caged"; that is, they are connected by guide bars.

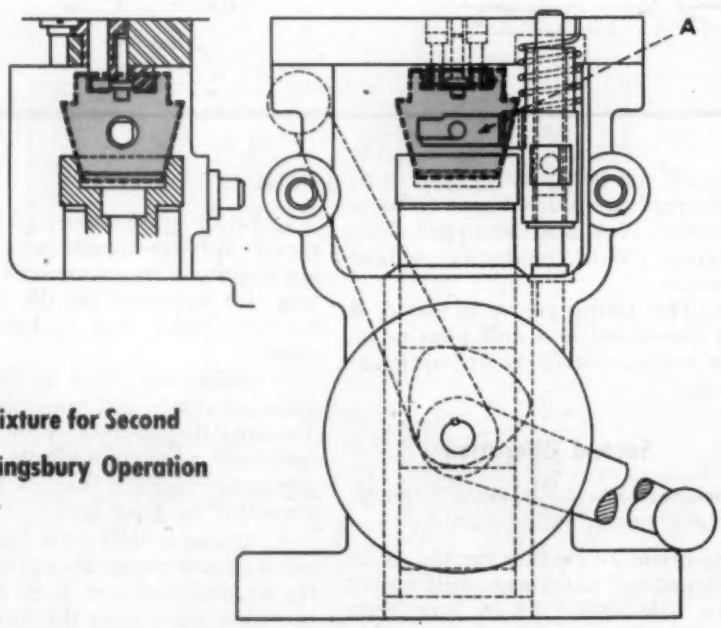
3. A locator with pilot pin is provided in each chuck. The operator slips the counterbored end *B* of the first-operation blank onto the locator, engaging the pilot pin with the drilled hole in the part. When the chuck jaws close they grip the fuze body on the



FUZE BODY

First Kingsbury Operation





Fixture for Second Kingsbury Operation

taper and seat the counterbore on the grooved face of the locator. In this way the front end of the body is counterbored to the proper depth *C* in relation to counterbore *B*.

FUZE BODY—Kingsbury Operations

Weatherhead Practice:

Three Kingsbury multiple-spindle machines are employed to drill and tap a number of holes in the fuze body after it leaves the Goss & deLeeuw second-operation chucking machine. Multiple-station equipment was selected to conserve floorspace and labor.

First Kingsbury Set-Up

The fuze body is placed nose end down in a tapered nest in the fixture base, which is then raised with a cam clamp. This action causes a gaging plug to enter counterbore *B* in the base of the fuze body to establish the correct height for drilling the slider pin hole *D*. Horizontal and vertical heads are used on the eight-station machine. Bushings for vertical operations are located in the fixture itself; bushings for horizontal operations are carried in sliding bushing plates that engage two locating pins at fixture stations. Operations are as follows (vertical heads are designated by V and horizontal heads by H):

First Station—Load.

Second Station—(H) drill 12 mm. slider pin hole 1 in. deep; (V) drill and countersink for ¼ in.-28 tapped hole *F*, using a 0.206 in. step drill.

Third Station—(H) feed 12 mm. drill to depth to complete slider pin hole.

Fourth Station—(H) Counterbore the slider pin hole to 0.490 in. and square the bottom and ⅛-in. drill point; (V) with No. 28 drill, at *F* drill hole 5/32 in. beyond hole for thread.

Fifth Station—(V) drill 0.077 in. hole at *F*, into the slider pin hole.

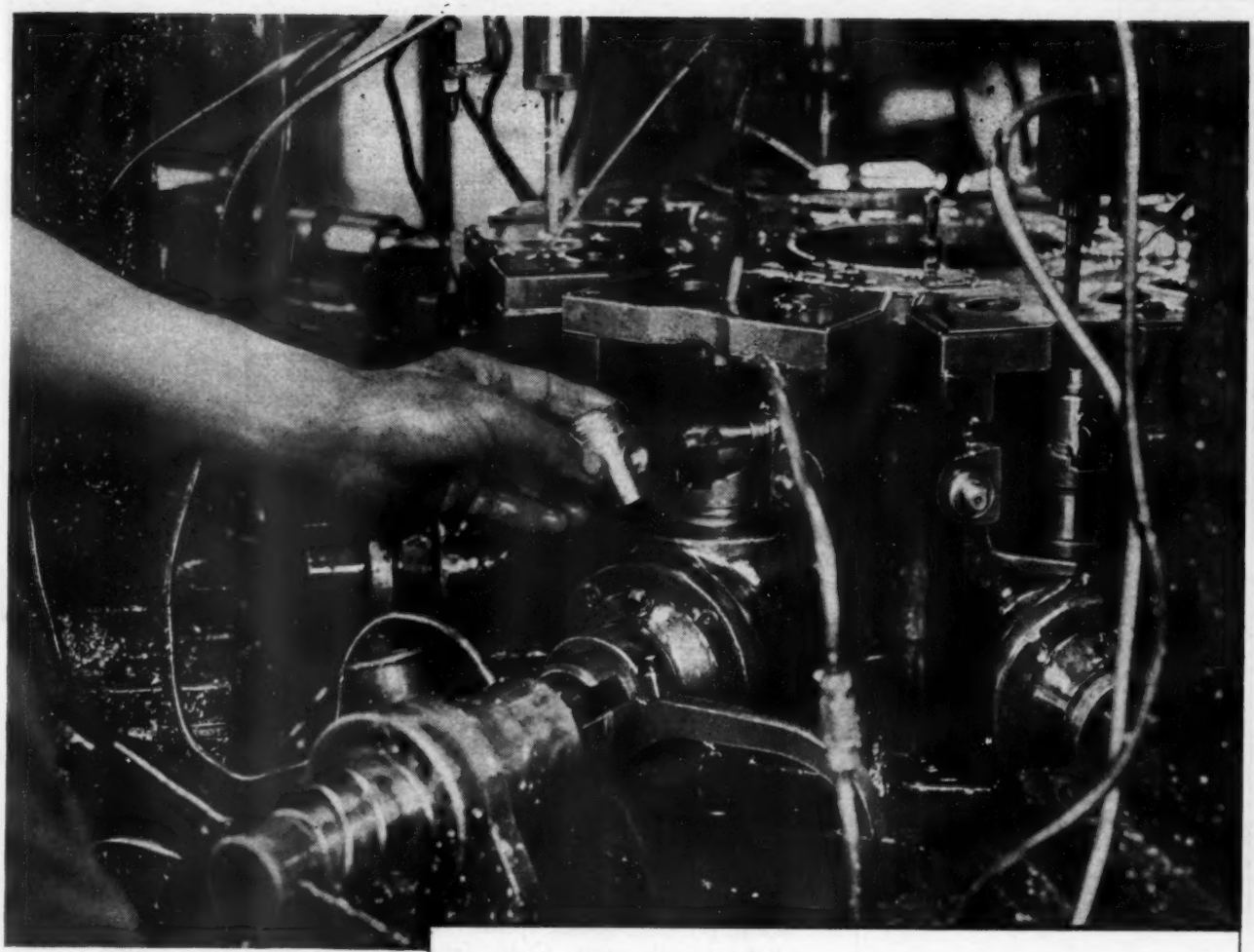
Sixth Station — (H) Counterbore mouth of slider pin hole to 0.630 in. and 0.565 in. with a step drill; (V) at *F* counterbore 0.139 and 0.211 diameters, the latter for the thread.

Seventh Station—(H) Finish ream the ½ in. slider pin hole.

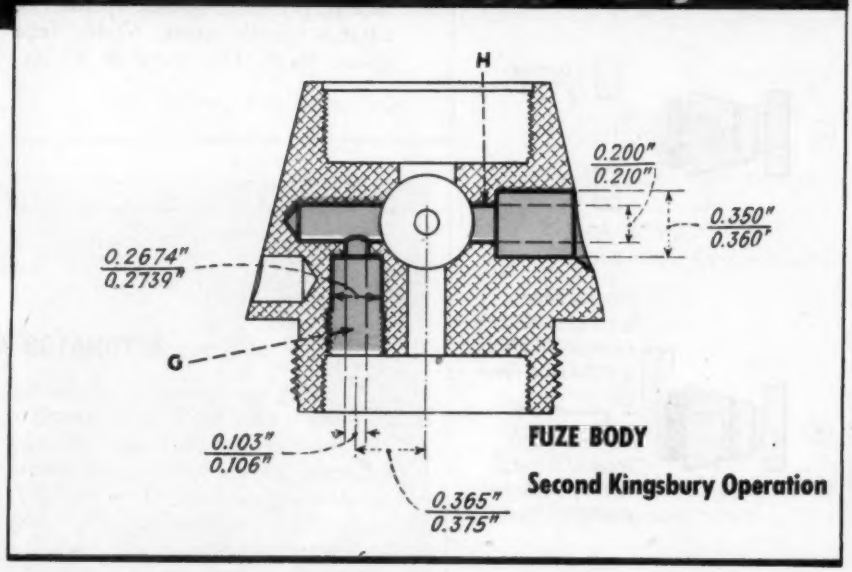
Eighth Station—(H) Tap 9/16-24 thread in slider pin hole; (V) tap ¼-28 thread in hole *F*.

Second Kingsbury Set-Up

The fixture used on the eight-station machine is identical with the previous set-up, except for the addition of a



In a second set-up on Kingsbury equipment the fuze head is located from the slider hole by a swinging fixture pin. The pin establishes the slider hole at right angles to the tools that will machine the safety-pin hole



Second Kingsbury Operation

swinging locating pin *A* to engage the slider pin hole. Objectives of the second Kingsbury set-up are to drill, counterbore and tap the stepped hole *G* and drill and counterbore the safety pin hole *H*. Operations are as follows:

First Station—Load part onto swinging fixture pin and seat the nose end in the tapered, or bellmouth, nest. The fixture pin locates the part so that the safety pin hole will be drilled at right angles to the slider hole.

Second Station—(V) Drill and counter-tersink at future thread section of stepped hole *G*.

Third Station—(H) At counterbored section of safety pin hole, drill 21/64 in. hole 3/8 in. deep to point.

Fourth Station—(V) At *G* drill a 0.104 in. hole that will open into the safety pin hole.

Fifth Station—(H) Drill safety-pin hole *H* with 13/64 in. drill to a point past the slider hole.

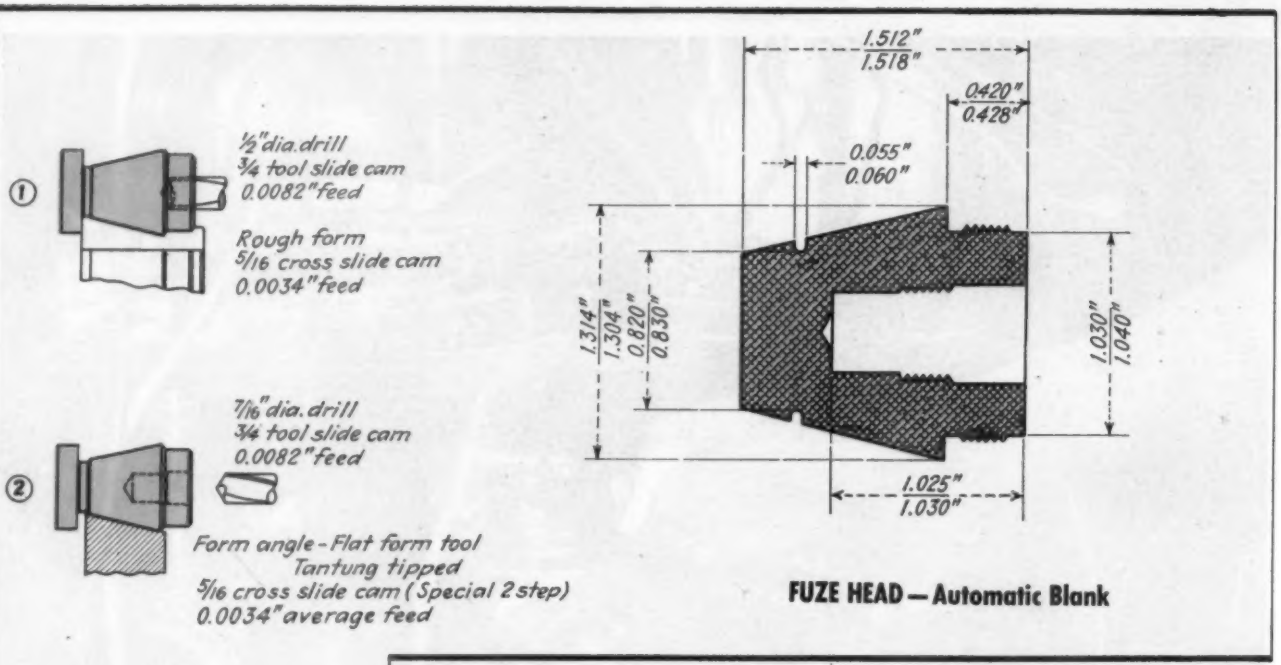
Sixth Station—(H) Counterbore and countersink the safety-pin hole. (V) counterbore *G* and radius bottom.

Seventh Station—(H) Drill the safety-pin hole to final depth.

Eighth Station—(V) Tap the 5/16-24 in. thread in hole *G*.

Third Kingsbury Set-Up

The part is held base end down in the fixture while machining the staking groove and the 0.067 in. hole that receives a retaining, or safety, spring until the fuze is to be used. To locate the piece in the fixture, the slider hole is first engaged with a locating pin in the movable upper portion of the fixture. Then counterbore *B* is engaged by a locating plug.



FUZE HEAD — Automatic Blank

FUZE HEAD

Material: 11 ST aluminum. 1 15/16 in. bar.

Machine: Cone 1½ in. automatic or National Acme RA 6 1⅝ six-spindle machine. When performed on the Cone automatic, details of the set-up are: cutting speed, 244 surface ft. per min.; spindle speed, 711 r.p.m.; spindle gears, 62-46; feed gears, 38-40. One piece in 12 sec.

Notes:

1. Because of the ring groove, one cannot specify spiral relief on the finish form tool to obtain good finish. Chief requirements for this tool are, therefore, accurate grinding of contours.

2. The stepped hole and thread are obtained "for nothing" while external operations are performed on the part.

DETONATOR CAP ASSEMBLY

In making the detonator cap assembly, faster production, with complete safety to the operator, has followed application of an air-actuated fixture to a spinning machine. Two cylinders are fitted to the machine: one raises and lowers the spindle 1½ in.; the other closes the vise and moves the fixture slide 2½ in. to position the work under the spinning tool. The latter distance is sufficient to keep the operator's hands from the tool while loading and unloading the fixture. The combination of two short movements speeds production.

The operator first places a detonator pin in the nest, then pushes a pierced detonator cap (a metallic part) over the end of the pin. She steps on a pedal actuating a master control valve. Ram of the fixture is fitted with a cam that bears on a cam roller pinned to a fulcrumed lever. As the ram moves toward the machine spindle, the lever closes the movable vise jaw upon the detonator cap with just sufficient force to prevent rotation of the part. The fixture slide is also moved toward the spindle and comes to rest against a stop.

At the proper point in the cycle, the spindle is moved down until the spinning tool comes into contact with the work, to head the detonator pin. When the operator removes her foot from the pedal, both rams return to their outer positions. Spring pressure returns the fixture slide to the loading position and unclamps the assembly so that it can be removed.

HOUSING DELAY

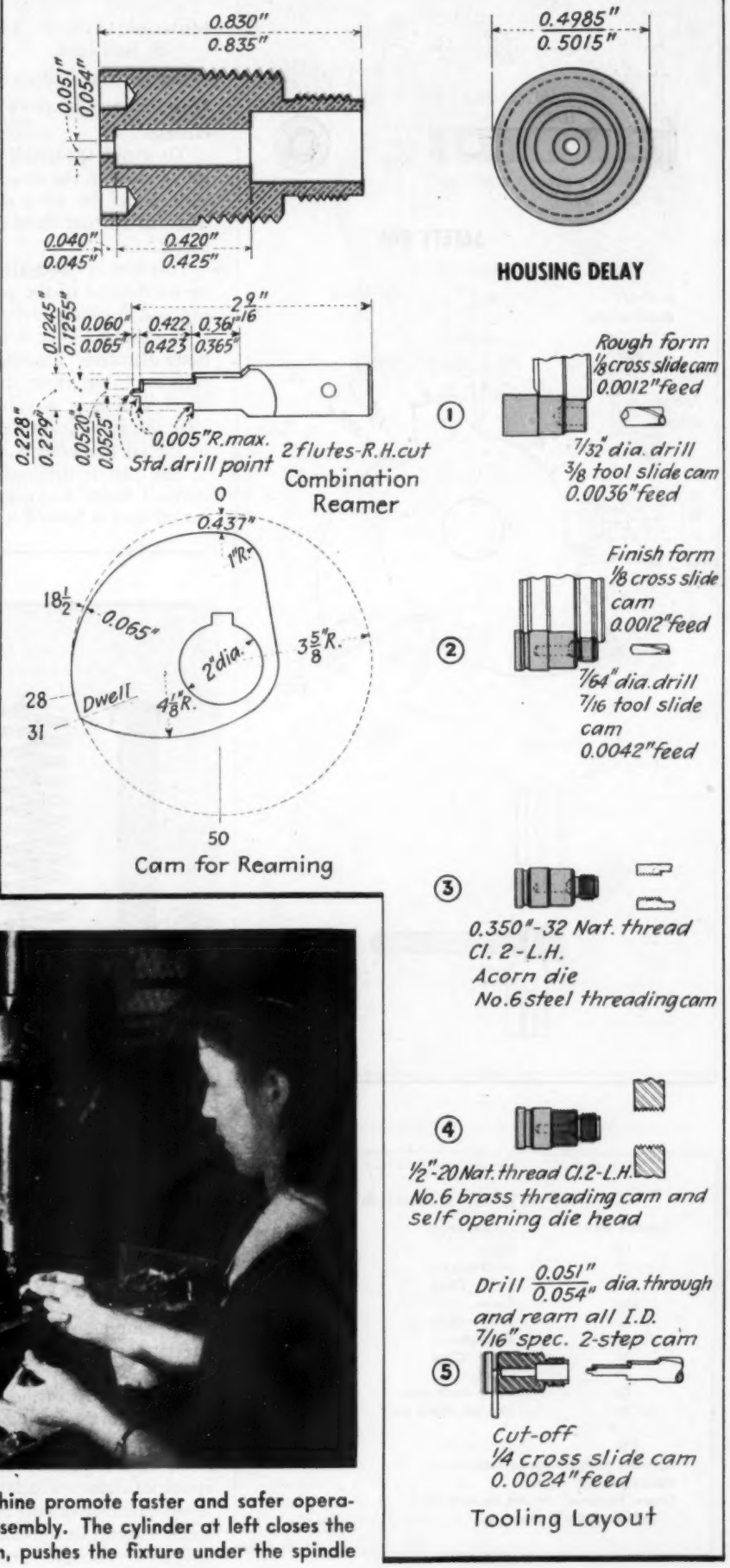
Material: ½ in. bar, SAE 72 free-turning brass, Composition B, half-hard.

Machine: Davenport No. 2 five-spindle automatic. Cutting speed, 253 surface ft. per min. Spindle speed, 1930 r.p.m. Spindle gears, 36-28. Feed gears, 34-80. Threading gears, 32-32.

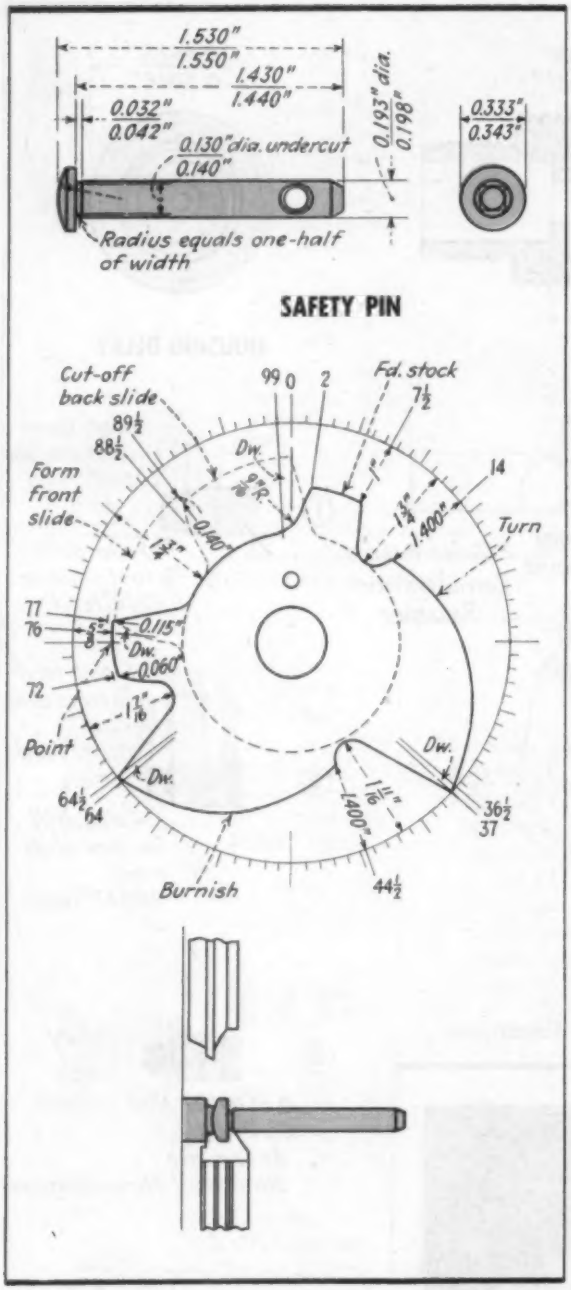
Production: One piece in 3.9 sec.

Notes:

Originally this job was run on a Brown & Sharpe No. 0G in a time of 12 seconds. When the job was shifted to a five-spindle Davenport, Weatherhead engineers contemplated doing all operation except the 0.051-0.054 in. hole at the cut-off end. It was discovered, however, that drilling this hole in a second operation cost more than the first operation. Hence a flat reamer was developed with a standard drilling point. Used at the fifth station of the Davenport, this reamer drills through the thin wall left at cut-off end of the piece by the third operation and finishes the other two diameters of the stepped hole. Chief requirement in making the flat reamer is to provide sufficient room for chip clearance.



Two cylinders fitted to a spinning machine promote faster and safer operation when making the detonator cap assembly. The cylinder at left closes the vise holding the cap and detonator pin, pushes the fixture under the spindle



SAFETY PIN

Material: 11/32 in. SAE No. 72 free-turning brass, Composition B, half-hard.

Machine: No. 0 Brown & Sharpe, spindle speed 4150 r.p.m.

Production: One piece in 7 sec.

Notes:

To avoid springing the piece, the form and cut-off tools are set as close to the chuck as possible. The form tool on the front slide necks the piece and breaks down the rear end at the head. The cut-off tool finishes the radius on the head and cuts off the piece.

Pointing is done after burnishing, to remove the burr thrown up on the end of the piece by the burnishing tool. But the pointing and forming tools do not overlap.

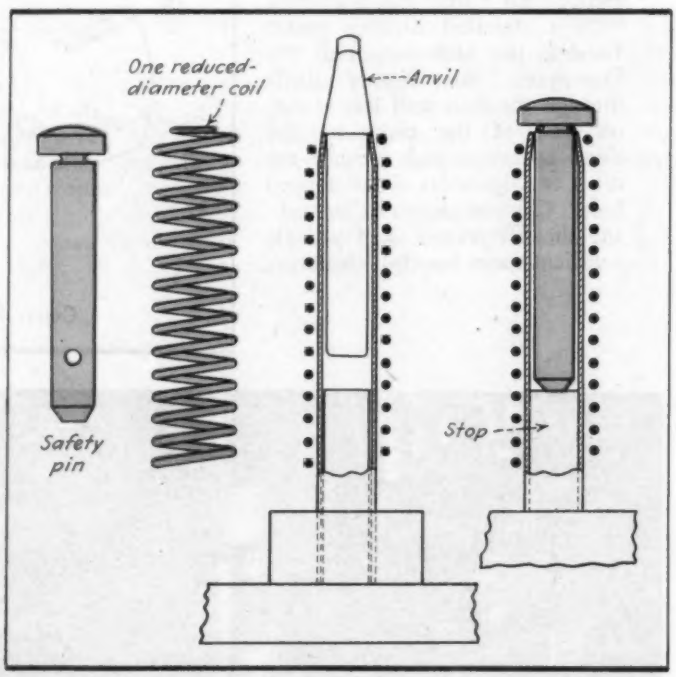
A standard B & S No. 20K box tool is used for turning the body diameter. Likewise a B & S 3-roll burnishing tool, with the rolls set to the mean diameter, is used to burnish the body diameter. Wherever possible, Weatherhead engineers attempt to realize the full capabilities of the machine by using either standard or special attachments, in order to avoid a second operation.

The part is directed into a mesh tray by means of a leather-covered finger to avoid nicks. The cross-hole is drilled and the cut-off end is burred in a second operation.

Cam Layout for No. 0 Brown & Sharpe

Spindle Rev.	Operation	Feed
10	Clear	
27	Feed stock	0.0129
32	I. T.—Clear	
111	Turn	0.0148
36	I. T.—Clear	
97	Burnish	0.0031
36	I. T.—Clear	
24	Point	
60	Form-front slide	0.0019
51	Cut-off—back slide	0.003
484		

Spindle: 4150 r.p.m. forward
Backshaft, 180 r.p.m.
Gears: backshaft, 96; 1st on stud, 48; 2nd on stud, 40; worm, 28



SAFETY PIN AND SPRING ASSEMBLY

A compression spring is assembled to the safety pin to eject the latter when the M-53 fuze is armed. It is essential that the spring be securely assembled to the safety pin so that the spring will not remain in the fuze and make the device inoperative. For this reason, the spring has one end coil of reduced diameter to engage tightly a looking groove on the pin just below the head.

In volume production, assembly of the spring to the safety pin is one of those secondary operations that can cause a lot of trouble in maintaining quality besides absorbing considerable labor. In fact, it did so until the development of rather simple tooling. A small air cylinder, controlled by pedal, is mounted vertically on a bench

SLIDER PLUG

Material: 5/8-in. SAE No. 72 free-turning brass, Composition B, half-hard.

Machine: No. 0 Brown & Sharpe. Turning speeds, 3600 and 900 r.p.m.

Production: One piece in 6 sec. (would be 5 1/3 sec. on a new OG Brown & Sharpe).

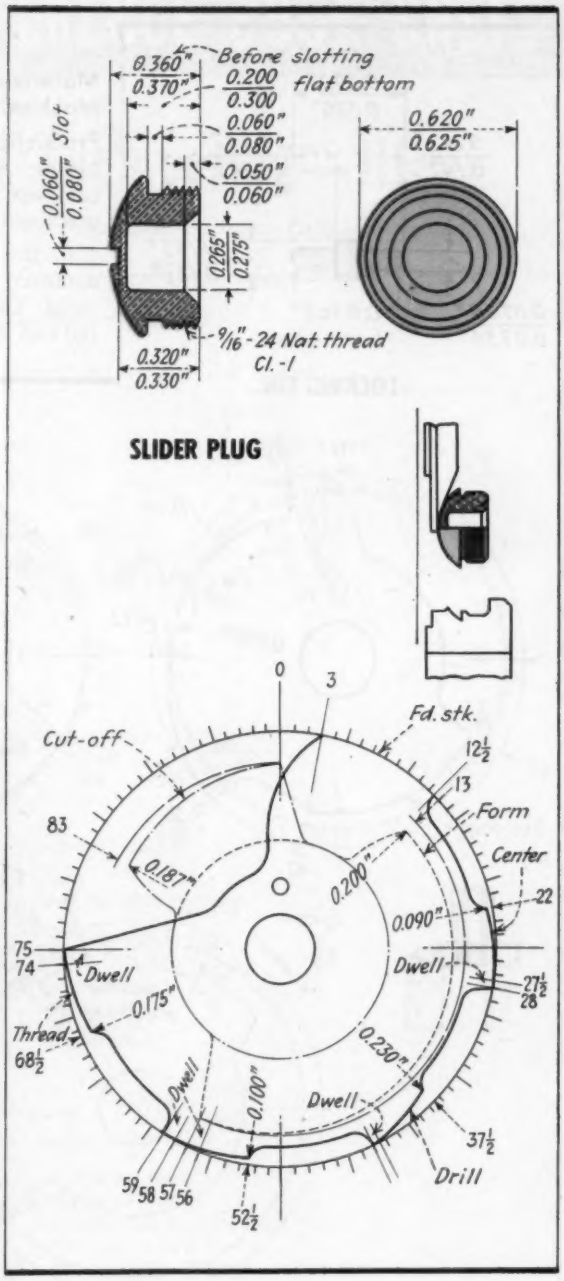
Operation Sequence:

1. Feed stock
2. Center
3. Drill
4. Bottom drilled hole and chamfer
5. Thread
6. Cut-off
7. Slot

Notes:

The cut-off time must equal a minimum of 22 cam hundredths, to allow the arm to overlap forming and pick up the piece for transfer to the slotting attachment. No overlap is permitted on the cut-off.

A combination flat reamer and bottoming tool chamfers the mouth of the drilled hole and bottoms the hole.



Assembly of a spring to the safety pin is speeded by a ram-operated collet that forces the spring down onto a hollow mandrel. When the pin is dropped into the mandrel, finger pressure causes the expanded first coil of the spring to snap into the locking groove under the head of the pin

stand. A tubular mandrel is mounted vertically under the ram, and the mouth of the tube is tapered at the same angle as a removable anvil. The anvil is dropped into the tube, and the spring is dropped over the anvil. When the pedal is depressed, the ram causes the attached split collet to force the reduced-diameter coil of the spring down over the anvil and onto the tube. On the upstroke, the collet picks up the anvil. Thereupon the operator drops a safety pin into the tube, and with finger pressure holds it in place while pulling up on the spring. The expanded end coil snaps into the locking groove on the pin, and the assembly is thrown onto the bench. The entire operation is extremely rapid, and the assembly is securely made.

Cam Layout for No. 0 Brown & Sharpe

Spindle Rev.	Operation	Feed
10	Clear	
32	Feed stock	
32	I. T.	
20	Center	0.0045
32	I. T.	
19	Drill	0.012
32	I. T.	
24	Bottom	0.004
32	I. T.	
22	Thread	
27	Clear	
58	Cut-off and slot	0.003
340	Form 100 rev.	

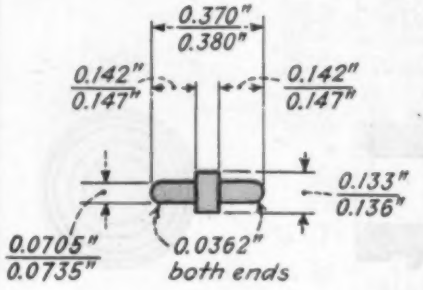
Spindle: 3600 r.p.m. forward; 900 r.p.m. backward
Backshaft: 270 r.p.m.
Gears: Backshaft, 72; 1st on stud, 72;
2nd on stud, 80; worm, 34

LOCKING PIN

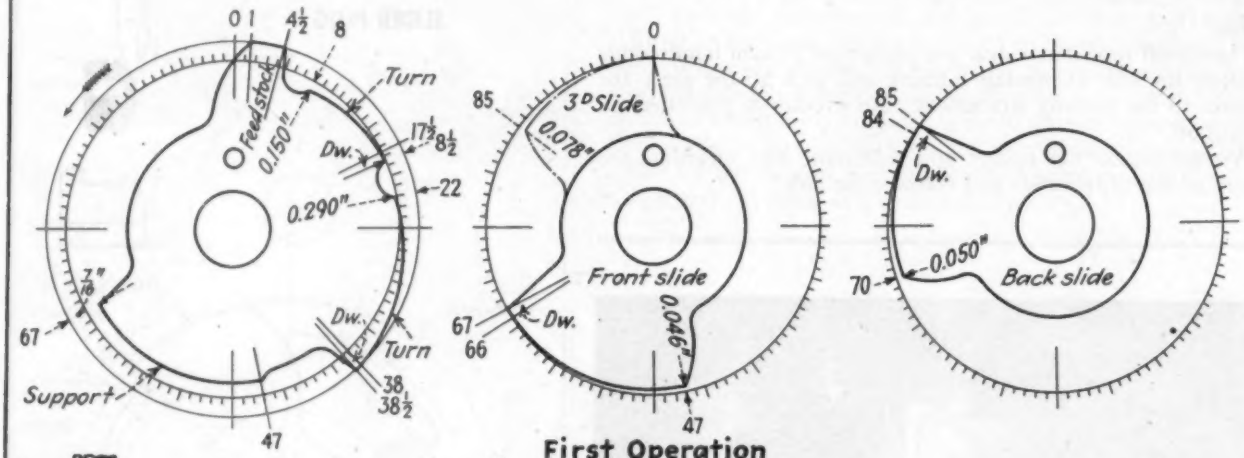
Material: 0.133-0.136 in. WD-X1335, WD-X1314 or WD-X1315 steel.
Machine: No. 00 Brown & Sharpe.

Production: First operation, 10½ sec. Second operation, 7 sec.
Notes: A true radius is required on both ends. It proved impractical to complete the part in one operation. So at the first operation one end is machined complete and the other end is left 0.010 in. long.

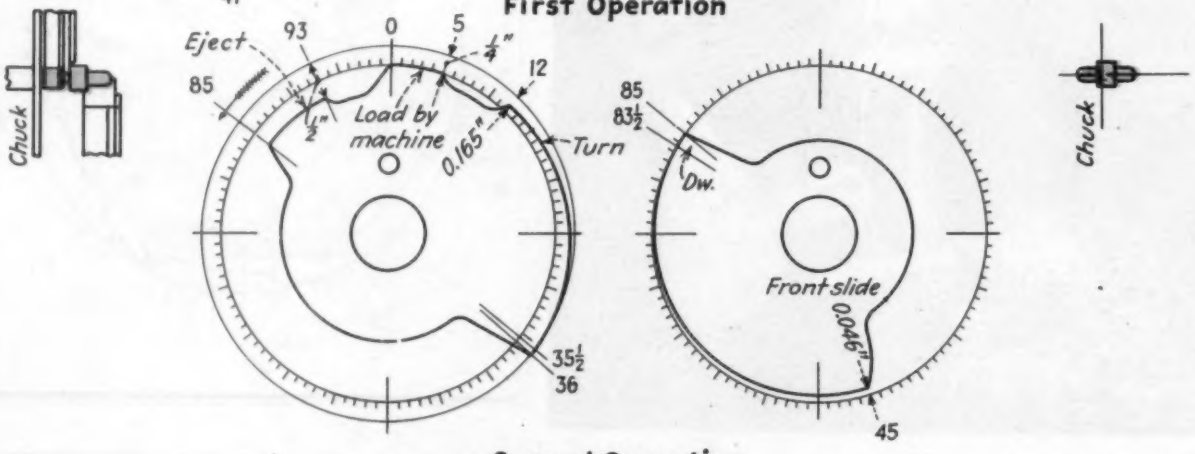
In the second operation, the piece is chucked on the 0.133-0.136 in. diameter, using a B & S equipped with a turret loader and an ejector in the collet. The 0.0705-0.0735 diameter is turned first with a box tool, and then the end is finish formed by a tool on the rear slide.



LOCKING PIN



First Operation



Second Operation

CAM LAYOUTS FOR NO. 00 BROWN & SHARPE

FIRST OPERATION

Spindle Rev.	Operation	Feed
7	Clear	
14	Feed Stock	
17	I.T.	
49	Turn	0.0033
17	I.T.	
77	Turn	0.0039
40	I.T. & Clear	
93	Support	
	Form (93 rev.) front slide	0.0005
14	Clear	
70	Form—black slide	0.0007
70	Cut-off—3rd slide	0.001

Spindle speed: 2670 r.p.m.
Cutting speed: 95 surface ft. per min.

SECOND OPERATION

Spindle Rev.	Operation	Feed
18	Load by machine	
25	D.I.T.	
87	Turn	0.0019
33	Clear	
146	Form	0.0003
30	Clear and eject	
26	D.I.T	

Spindle speed: 3122 r.p.m.
Cutting speed: 100 surface ft. per min.

Letter Symbols for Gear Engineering—III

This American Standard was sponsored by the American Gear Manufacturers Association

List 3 Recommended Plan for Subscripts

A		*a*	average, active, addendum	*N*	normal base	*n*	normal
B		*b*	base, dedendum	*O*	outside	*o*	outer, original, basic, relative
C	cutter	*c*	crown gear, chordal, contact	*P*	pinion	*p*	pitch
D		*d*	diametral	*Q*		*q*	
E		*e*	equivalent, effective	*R*	root	*r*	radial, running
F	face advance, face contact	*f*	fillet	*S*		*s*	
G	gear	*g*		*T*	tool	*t*	transverse, total, whole, tangential
H	hob	*h*		*U*		*u*	
I	inside	*i*	inner, internal	*V*		*v*	
J		*j*		*W*	worm	*w*	
K		*k*	working	*X*		*x*	axial
L	lap	*l*		*Y*		*y*	
M	machine	*m*	for measuring mean	*Z*		*z*	

List 4 Letter Symbols for Gear Engineering

A. General Symbols

(These symbols also are common to other fields of science and engineering.)

a	acceleration, linear	*P*	[2]power
α	acceleration, angular	*R, r*	radii
h	depth, height	ρ	radius of curvature
D, d	diameters	*s*	stress
s	distance, linear or along an arc	*K*	stress concentration factor
θ	distance, angular (angle in polar coordinates)	*t*	thickness
L, l	lengths	*T*	torque
w	[1]load per unit length	*v*	velocity, linear
M	moment, bending	ω	velocity, angular
N	number (of teeth)	*W*	load (total)
n	revolutions per unit of time		

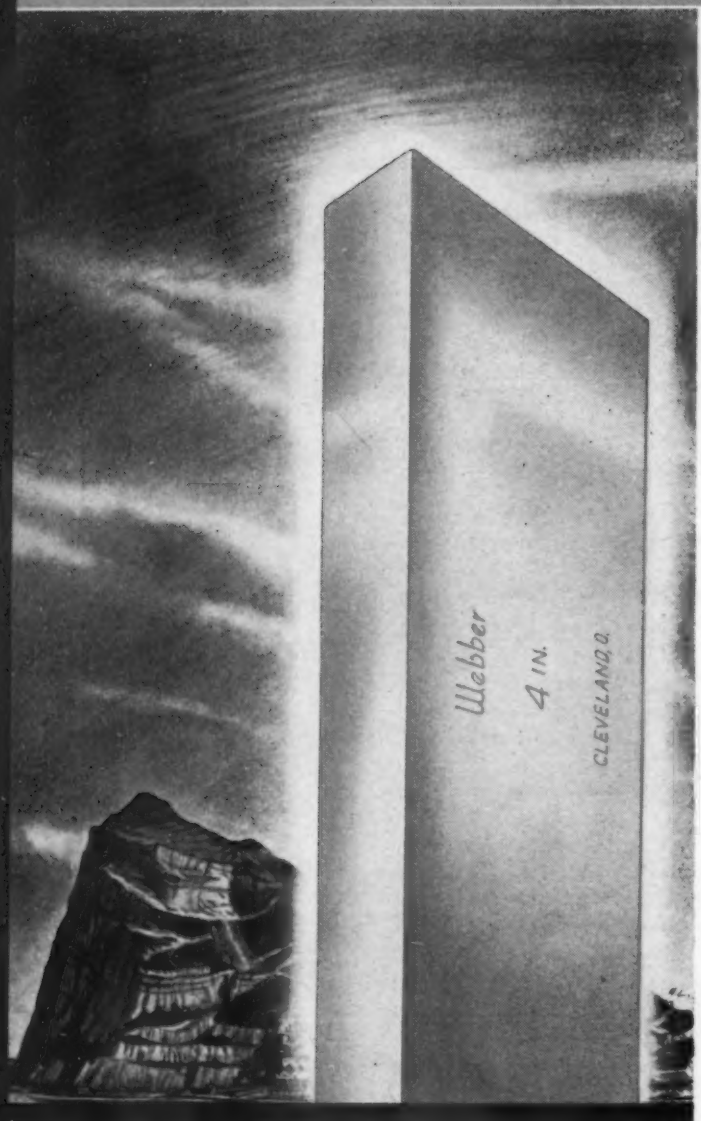
B. Special Symbols

(For convenience in use, this list includes also the General Symbols.)

a	acceleration, linear	b_g	dedendum of gear
α	acceleration, angular	b_p	dedendum of pinion
a	addendum	ζ	dedendum angle (in bevel gears)
a_g	addendum of gear	δ_g	dedendum angle of gear
a_p	addendum of pinion	δ_p	dedendum angle of pinion
a_c	chordal addendum (for tooth calipers)	*h*	depth, height
a_{nc}	normal chordal addendum (for tooth calipers)	h_k	working depth
α	addendum angle (in bevel gears)	h_t	whole depth (total depth)
α_g	addendum angle of gear	*D, d*	diameters
α_p	addendum angle of pinion	D, D_g	pitch diameter of gear
B	[3]backlash (on pitch circle)	d, D_p	pitch diameter of pinion
C	center distance	D_i	internal diameter
c	clearance	D_o	outside diameter of gear
A	cone distance (in bevel gears)	d_o	outside diameter of pinion
A_o	outer cone distance	D_b	base diameter of gear
A_m	mean cone distance	d_b	base diameter of pinion
A_i	inner cone distance	D_{bc}	base diameter of cutter
K	constant (factor)	D_e	equivalent diameter in normal plane
b	dedendum	D_r	root diameter of gear
		d_r	root diameter of pinion
		D_t	throat diameter (of worm gear)

[1] Unit loads frequently referred to in gears are pounds per inch of face width and pounds per inch of line of contact.
[2] Note that power is a correct general term and that horsepower is properly a unit of measurement.
[3] Backlash measured at any given place or in any given direction should be converted to a value on the pitch circle for comparison with a general standard.

WEARING QUALITY { ONE OF THE 5 THINGS TO LOOK FOR WHEN YOU BUY GAGE BLOCKS



Gage blocks must be able to stand up under normal usage without showing excessive wear. Performance records of hundreds of users of Webber Gage Blocks show that when their blocks are not misused or abused they show negligible wear after many months and even years of steady use.

Webber gave added protection to the original precision of the master gage blocks when he pioneered the use of "Wear blocks" with every set. There are two "Wear blocks" in each set. These are used in conjunction with the master gage blocks and are wrung onto the top and bottom of a group of blocks so that all contact with the work is taken on the surface of the "Wear blocks."

"Wear blocks" are easily replaceable at a nominal cost. Thus you assure longer life of the original blocks—maintain closer accuracy of all measurements—reduce the cost of using gage blocks for precision measurements.

In addition, Webber service includes complete facilities for the inspection, reconditioning and replacing of worn or damaged blocks at a moderate cost.

Webber offers a wide selection in the following sets:

Set No. 84A	$350.00
Set No. 84B	$235.00
Set No. 43A	$185.00
Set No. 43B	$150.00
Set No. 38A (Thin Blocks)	$195.00
Set No. 38B (Thin Blocks)	$155.00
Set No. 14A (Angle Blocks)	$450.00

Look for these 5 things when you buy Gage Blocks –

1. Dimensional Accuracy
2. Stability
3. Surface Finish
4. Wearing Quality
5. Service after the sale

Webber GAGE COMPANY

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Letter Symbols for Gear Engineering—IV

B. Special Symbols (Continued)

s	distance, linear or along an arc
θ	distance, angular (angle in polar coordinates)
Q_F	face advance (in a helical gear, $Q_F = F \tan \psi$)
F	face width
F_e	effective (or active) face width
F_t	total face width
Γ_G	face angle of gear (in bevel gears)
γ_G	face angle of pinion (in bevel gears)
K	factor
ψ	[4]helix angle
ψ_O	outside helix angle
ψ_b	base helix angle
ψ_p	pitch helix angle
l	lead (of worm or helical gear)
λ	lead angle $\left(\lambda = 90° - \psi, \tan \lambda = \frac{l}{\pi D}\right)$
L, l	lengths
l	length of line of contact
L	total length of lines of contact
Z	length of line of action
Z_a	addendum portion of line of action
Z_b	dedendum portion of line of action
W	load (total)
W_t	transverse, or tangential, component of load
W_n	load component normal to helix (in pitch plane)
W_N	load normal to surface
W_r	radial component of load
w	[5]load per unit length
M	moment, bending
m	module ($m = D/N$), British or metric
N	number (of teeth)
N_G	number of teeth in gear
N_P	number of teeth in pinion
N_C	number of teeth in cutter
N_c	number of teeth in crown gear
N_W	number of threads in worm
E	offset (of axes, in hypoid gears and face gears)
p	pitch, circular
p_b	base pitch (normal to involute)
p, p_t	[6]transverse pitch
p_n	[6]normal pitch (normal to helix)
p_x	[6]axial pitch (preferred to linear pitch)
p_N	normal base pitch (normal to surface)
p_{xw}	axial pitch of worm
P, P_d	[7]pitch, diametral
P_{nd}	[7]normal diametral pitch
Γ	pitch angle of gear (in bevel gears)
γ	pitch angle of pinion (in bevel gears)
P	[8]power
ϕ	pressure angle
ϕ, ϕ_t	[9]transverse pressure angle
ϕ, ϕ_n	[9]normal pressure angle
ϕ_x	[9]axial pressure angle
ϕ_C	pressure angle of cutter
ϕ_{xw}	axial pressure angle of worm
R, r	radii
R, R_G	pitch radius of gear
r, R_P	pitch radius of pinion
R_O	outside radius of gear
r_O	outside radius of pinion
R_C	pitch radius of cutter
r_T	edge radius of tool
ρ	radius of curvature
ρ_G	profile radius of curvature in gear
ρ_P	profile radius of curvature in pinion
ρ_n	radius of curvature in normal plane
ρ_e	relative radius of curvature ($1/\rho_e = 1/\rho_1 + 1/\rho_2$)
ρ_f	radius of curvature of fillet
m_G	gear ratio ($m_G = N_G/N_P$)
m_ω	angular velocity ratio
m_p	[10]contact ratio (of profiles) ($m_p = Z/p_b$)
m_F	[10]face contact ratio (in axial plane, $m_F = F/p_x$)
m_t	[10]total contact ratio ($m_t = m_p + m_F$)
n	revolutions per unit of time
Γ_R	root angle of gear (in bevel gears)
γ_R	root angle of pinion (in bevel gears)
Σ	shaft angle
ψ	[11]spiral angle (in bevel gears)
ψ_G	spiral angle of gear
ψ_P	spiral angle of pinion
ψ_b	spiral angle at outer cone distance
ψ_m	spiral angle at mean cone distance
ψ_i	spiral angle at inner cone distance
X	[12]strength factor ($X = t^2/4h$)
s	stress
K	stress concentration factor
t	tooth thickness
t_G	circular thickness of gear
t_P	circular thickness of pinion
t_n	normal circular thickness
t_b	tooth thickness on base circle
t_c	chordal thickness
t_{nc}	normal chordal thickness
t_x	axial thickness
y	tooth form factor for circular pitch
Y	tooth form factor for diametral pitch
Y_K	tooth form factor including stress concentration
T	torque
v	velocity, linear
v_t	[13]velocity in transverse direction tangential to pitch circle
v_n	[13]velocity in normal direction (in pitch plane)
v_x	[13]velocity in axial direction
v_N	velocity normal to surface
ω	velocity, angular
ω_G	angular velocity of gear
ω_P	angular velocity of pinion

[4] In gearing the helix angle is the acute angle between a tooth and the axis of the gear.
[5] Unit loads frequently referred to in gears are pounds per inch of face width and pounds per inch of line of contact.
[6] Pitch dimensions in the three principal directions. See Introductory Notes, Par. 4.
[7] Use the forms P_d and P_{nd} when necessary to avoid confusion when P must be used for "power."
[8] Note that power is a correct general term and that horsepower is properly a unit of measurement.
[9] Pressure angles in the three principal directions. See Introductory Notes, Par. 4.
[10] Contact ratio is the preferred term for what has also been called "average number of teeth in contact."
[11] Spiral angle in bevel gears is understood to be given at the mean cone distance unless otherwise stated.
[12] This strength factor is usually obtained in the graphical determination of tooth strength.
[13] Linear velocities in the three principal directions. Compare with footnotes 6 and 9.

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Manpower Won't Flow

The net effect of the invasion of France on war production has been to step up the pressure on certain items, particularly so-called heavy-heavy motor trucks, tanks and large-size shell. Though it is fair to say that the over-all volume of war output is eminently satisfactory, critical areas exist which are causing great concern in Washington. Manpower shortages are at the root of most of the trouble. Theoretically it should be possible to transfer workmen from one part of the country to another, as cutbacks and cancellations occur but reluctance of men to move around much is defeating this plan. Local manpower shortages must be met locally or within a short radius. Probably the most serious situation of all is in the foundry industry, which badly needs 15,000 to 20,000 men during the summer when production naturally slumps anyway because of difficult working conditions. Manpower Commissioner McNutt has issued a special appeal for volunteers for foundry service.

May Alter Production Program

The steel industry also is feeling strongly the influence of the shift in demand as a result of the French invasion. Steel mills have had trouble maintaining their operating rates as high as desired because of the large number of furnaces out for repairs and because of inability to get enough men. Several hundred thousand tons of steel have thus been lost, the effect being felt the worst by producers of indirect military items who are being forced to take reduced shipments. The War Production Board is struggling hard to meet third quarter requirements and is getting a small amount of relief from the British, who have agreed to send to the United States about 10,000 tons of steel a month. It is possible that cutbacks in war items, such as that in .50 caliber ammunition, may help relieve the situation. It is possible that the entire military production program may be overhauled in the light of the invasion experience. Such changes, many of which could be drastic, could alter the steel situation almost overnight.

Little Effect on Builders

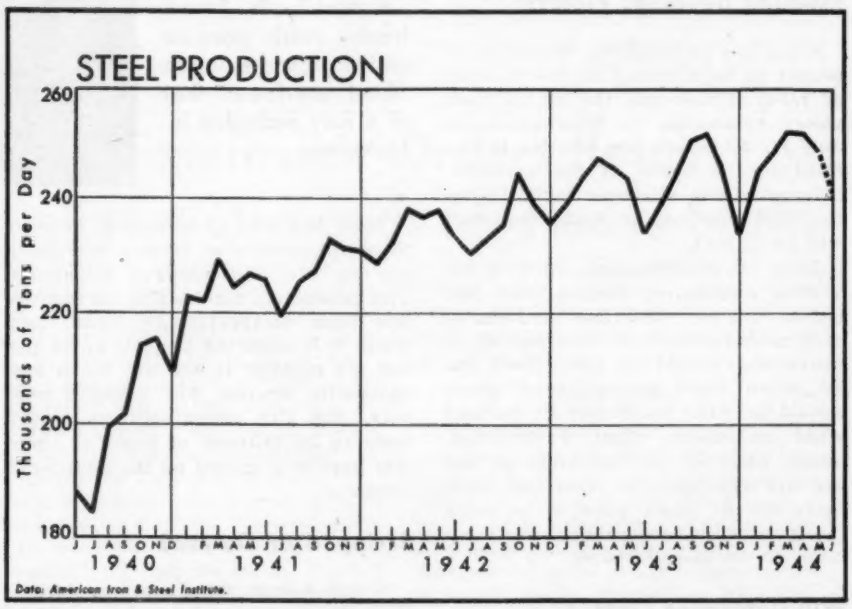
The controversy between Donald Nelson on one side and the armed services plus some top-side WPB executives on the other regarding the extent to which civilian production should be resumed will not seriously affect machine tool builders. The machine tool industry is struggling against a recently increased backlog of war orders totaling over $180,000,000, and monthly shipments from factories are not running more than $41,000,000. Builders have had tentative orders for some time from automobile companies and other customers to be filled whenever postwar tooling would be permitted. Those orders, in a sense, have never been translated into firm orders because they have had no legal standing and possess no priority rating. Though the present bitter controversy should be resolved in favor of allowing builders to take postwar orders, as seems likely, the orders could not be filled so long as any war orders stood in the way. However, the industry's war business is not well distributed throughout the industry and some companies probably could go to work on postwar orders very soon if permitted. Builders entertain no illusions about their war volume continuing at the present pace into 1945, unless some unanticipated development should turn up. In some instances builders have been asked to accelerate their machine tool operations, but have been prevented by important commitments for manufacture of direct war items.

Planes Larger; Output Levels

While June production of planes was lower in number than in any of the preceding ten months, the daily rate of output in terms of airframe weight was higher than in the preceding month and probably established a wartime record. The higher poundage but smaller number is explained by the fact that production is being concentrated more and more in larger planes. The new B-29's require many more manhours than the Flying Fortresses, and even the fighters are bigger. Also the cargo planes being built are much larger units than the trainer planes, manufacture of which has tapered off sharply. Since larger planes take more labor and materials, plane output appears destined to level off and perhaps drop, but there is nothing alarming about this development. It is true that certain types of planes were below schedule in June, but schedules of the more urgently needed types were met in most cases. Demand for replacement equipment in the combat zones continues high; factories making these products still are very busy. Outlook for resumption of civilian goods production on any sizable scale is dismal and probably must wait on the complete defeat of Germany.

Cancellations on Short Notice

More contract cancellations are on the way, but longer advance notice probably will be given than in the Brewster case. A top official says that "labor will be a controlling factor in cancellations" for some time, meaning that pressure will be put to avoid abrupt shutdowns. Government has no intention, however, of making one cent's worth of war goods that won't be needed. We won't be making munitions, for instance, just to keep people busy.


STEEL PRODUCTION
Thousands of Tons per Day
260
240
220
200
180
J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J
1940
1941
1942
1943
1944
Data: American Iron & Steel Institute.

It's the Heat—Steel production has increased since June, 1940, as new mills have been built, and dropped regularly with summer heat and winter cold. Operations now are entering another dip—one that will be aggravated by the loss of under-26 draftees and will not be tempered by further capacity expansion. Civilian steel allocations are not apt to rise, may even drop

Inside Detroit

BY SILER FREEMAN

Autos to Lead Reconversion

The automotive industry will have the unique distinction of being the first industry in the nation to be completely programmed for reconversion. As such it will be the "guinea pig" for the entire country in the plans for gradual transition from war to peace but it will be a willing guinea pig.

Chief reason for the distinction is that the War Production Board is convinced that the automotive genius, which won the Battle of Production in quick order, can do an equally good job in getting back into its old business, while at the same time fulfilling government contracts on war needs. In short, it is relying on the industry's oft-demonstrated "change of pace."

The planning has governmental sanction because leaders in Washington recognize that as the auto industry goes, so goes the nation, in prosperity. It is looked upon as the largest single potential user of labor, the bulwark against widespread unemployment. Some automotive executives resent such a burdensome trust but are willing to chance it. What with all its myriad of suppliers and sideline businesses and industries, it can fulfill this destiny if given proper cooperation.

Meeting Develops Picture

What lies immediately ahead is expected to be revealed at the meeting of WPB officials and the industry advisory committee in Washington on July 14. As before, the meeting is confined to the heads of the manufacturers and one alternate each. Unlike the first meeting in April, observers will be barred.

John H. Middlekamp, chief of the WPB's automotive branch, has had before him for some time the ideas of each manufacturer on what partial reconversion should be like. Each has set down what his minimum quota should be, what machinery he has and what he needs, what government-owned facilities and machines he can use and what must be taken out, what materials he must have to go back into production, according to his minimum to be manufactured.

Will Determine Quotas

With all this data in advance, there will be a discussion on establishing the number of cars which WPB will permit and how many each should get as his quota. The entire reconversion status is pretty well established.

Since manufacturers have submitted their data in advance, WPB has had a chance to do definite programming. It knows machine and material requirements and has been given exact figures on how soon each could get back into car production.

But there are some obstacles ahead, in addition to awaiting Germany's surrender. For instance, none knows exactly when he can get components. The suppliers' status is not as clear as the manufacturers'.

What some of the forward-looking manufacturers have done to ease this situation is to keep new sub-contracting away from suppliers. Packard has been doing this for some time in anticipation of what may come.

Now, the "Weasel" —A low-slung, square-faced personnel and supply carrier capable of operating over a greater variety of terrain than any other vehicle, has been in production at Studebaker's South Bend factory for almost two years. Nicknamed the "Weasel," its broad tracks exert pressure on the ground equal to about one-fourth that of a fully equipped infantryman.

Then, the total of cars to be allowed to be manufactured is also dependent on the tire and gasoline situations. Tire production for the first six months has been disappointingly small and while it is expected to pick up in the last six months, it will not reach any optimistic figures. For 2,000,000 new cars, the tire manufacturers would have to be relieved of some of their war burden to crowd on the additional needs.

Stripped or Deluxe?

Which brings some more problems. Will the new cars have four or five tires? This may mean the difference in 2,000,000 tires. Again, the old question of what is an automobile may have to be debated. Will WPB permit manufacture of the old-time automobile with all the extras such as heaters, defrosters, radio, cigar lighter, double horns, etc. or will it restrict the first ones to stripped down versions containing the essentials?

Another topic which the industry meeting will have on its agenda relates to the experimental models which Donald M. Nelson said the manufacturers could work on in the meantime. His language was somewhat ambiguous in relation to the trade practices.

Each manufacturer makes about 20 different models, ranging from coupes to limousines. Will they be permitted to make one version of each line or only a single model?

Battles Shift Output

Two of the Detroit area's three tank plants have been revived through the renewed emphasis on the big battle-wagons. The Fisher Body plant at Grand Blanc has more than doubled its output in the past month and the Chrysler arsenal is working longer hours and more shifts.

The changing emphasis is also being felt in the Dodge and Chrysler divisions of Chrysler Corp. Both have been put to work on making rocket shells for the new rocket guns which are doing heavy damage in the invasion.

Dodge main plant is making the nose piece for the shells and the components. Assembly of the projectile is being done in the Chrysler division. Dodge is carrying out this hurry-up contract with about 80 percent of the machine tools it once used on cars.

New Termination Office

Because of the large number of aircraft contracts held in this area, the Central Procurement District of the AAF Materiel Command has set up a readjustment division here to handle all AAF termination matters.

American Machinist's Own War Correspondent Reports

A bombing, the details of getting established as a war correspondent and as a resident of the British Isles and a trip to Normandy occupy his first week abroad

William J. Hargest

William J. Hargest, associate editor of AMERICAN MACHINIST, landed in Britain the day that France was invaded. He is there for an extended stay to report to our readers the latest techniques in metal-working production in England's war industries. The material on this page is drawn from his letter describing his first week there.

LONDON, June 9—Registered with the Metropolitan police (London) and secured food and clothes ration cards from the Ministry of Food. Secured war correspondent's credentials, requiring more finger printing. Procured flashlight and had new insignia sewed on my uniform. Attended press conference at 5:30 p.m. Then dinner and off to the country.

June 10—Spent all day with relatives of mine (name of place censored). During a walk to the village, I underwent my first air raid. I'll never forget the rumble of anti-aircraft batteries in the distance. Then the few people on the way to the air-raid shelter, and the many more who so complacently walked about their regular business. My uncle and I walked over to a large stone building and watched the skies from the doorway. In but a few minutes planes came flying over, and not too high. And then came the rumble and concussion of an explosion as a single bomb fell, not close and yet not far away, about 500 yards. It was over in less time than it takes to write about it. But the guns were still blasting in the distance. Then silence. My reaction to all this was one of curiosity. It might have been different had the planes come in to drop sticks of bombs and machine gun the place as they did in the blitz of 1940, the only remaining evidence of which are the holes in the wooden buildings and the chipped stone walls left by .50 calibre bullets.

June 12—Spent about two hours at the London office and the rest of the day getting a British press pass and becoming accredited at SHAEF (Supreme High Allied Expeditionary Forces Headquarters). Now at last I became fully accredited as a war correspondent, having (1) registered with the London police, (2) secured food and clothes ration cards, (3) secured U. S. Army correspondent's certificate and card, (4) obtained non-combatant's certificate, (5) obtained British press pass, and (6) became accredited at SHAEF. All of these are required before one can move out of London on any kind of a job. Sheaves of instructions went with the list of credentials, and they all had to be read carefully. So the rest of the day and late into the evening I sat in my room and perused the instructions carefully, making notes of the important items.

June 14—Spent all day at the London office. Saw my first London movie, three news reels and a Micky Mouse. Read the evening papers and ran across a paragraph about barges fitted with machine tools for salvaging damaged landing craft during the invasion. I mention this because it is the reason for events of the next few days.

June 15—Decided I would try to get a story on the repair barges. Besides, I figured it would give me a chance to learn the technique of approaching the Royal Navy press relations people. After lunch I started at our own press relations office, and after visiting officers at SHAEF, the British Admiralty, and Home Security, I finally told my story to the British Navy captain in charge of the repair barges. He said that he would try to get permission for me to visit a couple of the barges, but by 7 p.m. had had no success. He took my phone number at the hotel and asked me to stand by for an O. K.

June 16—At 5:30 p.m. I attended the SHAEF press conference. As I was presenting my credentials at the door, Captain John Cresswell, Royal Navy, called me into his office. He finally had secured approval for me to visit barges equipped with machine tools and used to repair landing craft. He handed me my orders which were as follows: "Please report to Lt.-Com. Pursall, RN, tonight, Friday, to embark at 0800 hours tomorrow." During my conversation with Cresswell, he stated that I would have to cross the channel to see the barges at work. So plans were made for my doing the job on Sunday and arriving back at midnight, Sunday.

I left Waterloo station in London at 8:45 p.m. Friday. I hit the French coast Saturday afternoon and saw these repair barges in action, reequipping and repairing landing craft in all states of damage from rough water, mines and enemy action. The barges are afloat in most cases, but some are on dry land and are mobile (equipped with machine tools, welding units, etc.), having been sent inland to bases a few miles off shore. I visited them all, and finished by 7 p.m. Sunday. Incidentally, I visited German coastal fortifications, saw shore barricades and some devastating results of warfare. When I got back to the ship, ready to be transferred to a cross channel cutter, the seas became so heavy that no barge could put alongside. And the seas became worse. Consequently, on Wednesday, I was still weatherbound.

Large Equipment Orders Result From Demands for Heavy Shells

WASHINGTON—Sharp upping of the production of heavy artillery ammunition, dictated by unprecedented demands from the combat zones, will result in purchases of machine tools, presses and furnaces to a value of approximately $100,000,000. This was announced by Brig. Gen. R. E. Hardy, chief of the ammunition division of the Ordnance Department.

Contracts have been placed with 56 companies to step up the production of 155-mm., 8-in. and 240-mm. shells. Virtually all ammunition loading plants of the Ordnance Department will be expanded and a similar expansion has been ordered in chemical and explosives plants.

The War Production Board has granted the highest priority on equipment and material and the War Manpower Commission has granted similar priority on the referrals of labor.

The Army previously ordered the output of big guns stepped up and the tank program has been increased in recent months.

Budd Shifts

Production shifts have resulted from this newly placed emphasis, as in the case of the Edward G. Budd Manufacturing Co., Philadelphia, which was recently loser of contracts for almost 1,000 all-steel Conestoga cargo planes. The company will get into heavy artillery ammunition production with contracts for "millions of dollars" worth of shells, Col. Jared Ingersoll of the Philadelphia Ordnance District reported recently.

After months of retooling, between 3,000 and 3,500 workers will be employed at Budd's Bustelton plant.

Picture Aircraft Industry Importance to Postwar Economy

Government support of technological development and research urged by ACC leaders before Senate committee. Detail Industry program. Would cut auto makers first

WASHINGTON — Provision for the continuation of technological development, with the government supporting general research and private industry attending to the details, was urged by aviation industry witnesses appearing before the subcommittee on war contracts of the Senate Military Affairs Committee.

Leaders of the Aeronautical Chamber of Commerce appeared to offer a program for reconversion and great expansion of commercial and civilian flying in the postwar era. The program also urged the permanent maintenance of a powerful air force as a safeguard for peace.

All witnesses agreed that the present $21,300,000,000 industry would have to be reduced to about one-fifth its present size. But they insisted that if the cutbacks were carried out in an orderly manner, largely as outlined in the Murray-George bill, the industry could be made an asset in the difficult economy of demobilization and a power so great that no aggressor in the future would dare to challenge it.

Industry Represented

E. E. Wilson of United Aircraft spoke for the big engine makers; Harry Woodhead of Consolidated Vultee spoke for the manufacturers of large airplanes; J. Carlton Ward, Jr., president of the Fairchild Engine and Aircraft Co., spoke for the technologist, as well as for the makers of medium planes and engines, and Joseph T. Geuting, Jr., of General Aircraft spoke for the private flier, while J. Henry Berliner discussed the problems of the maker of the small private plane. The first four speakers represented the Aeronautical Chamber of Commerce.

Mr. Wilson, who opened the hearing as chairman of the Aeronautical Chamber of Commerce, described the industry's program as resting on four principles: 1, air forces of such strength and in such readiness as to preclude a successful assault on this country or its possessions; 2, acquisition and maintenance of air bases essential to security and overseas trade; 3, orderly and economic expansion of domestic and international air transport and private flying, and 4, a strong aircraft industry as necessary to the first three.

Urges Quick Termination

Mr. Wilson emphasized the necessity for positive measures to retain a strong nucleus of management, technology and manufacturing facilities, offered by the aircraft industry. Discussing the possibility of retaining such a nucleus, Mr. Woodhead asked for quick reconversion of plane manufacturing facilities. He urged early notice of contract termination, to the manufacturer involved, to other government agencies and to the communities concerned.

Mr. Woodhead urged that that part of the automotive industry now in aircraft manufacture be cut back first. "They have a pent-up demand for their product that they will be eager to fill," he said.

China Aircraft Formed to Boost Chinese Air Industry

SAN FRANCISCO—Operating under the auspices of two Allied governments, founded with the blessings of Generalissimo Chiang-Kai-shek and the U. S. Army Air Forces Materiel Command and financed by a $500,000 loan from the Defense Plant Corp., China Aircraft Corp. will begin operations in August under a one year contract with Douglas Aircraft Co.

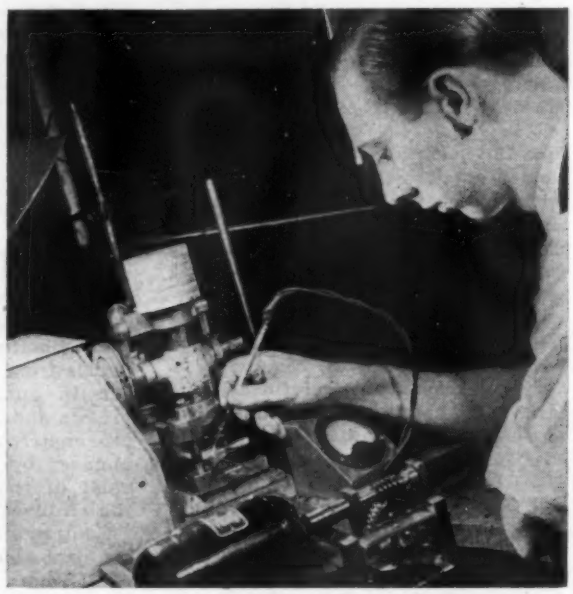
Incorporated under the laws of California and capitalized at $250,000, China Aircraft is owned totally by 30 large Chinese families, here, whose members subscribed the fund within two weeks. At war end, when U. S. financial aid is withdrawn, the corporation will endeavor to continue through support of the Chinese government as well as international marketing programs of Douglas and other aircraft companies.

Production of Standard Type Rockets Scheduled to Soar

NEW YORK—Highest urgency rating of U.S. Ordnance has been assigned to procurement of vastly increased quantities of the "standard" artillery-type rocket projectile—a missile with the potency of a 105 artillery shell. Made until now solely by Rome Manufacturing Div., Revere Copper & Brass Inc., the rocket is used by land, air and sea forces to overcome resistance of enemy strongpoints. A simple light weight mount is used to discharge the projectile, or launching tubes are fitted to landing barges or aircraft. In addition to terrific firepower that can be achieved, rocket projectiles are easily portable in quantities; artillery pieces weigh 12,000-14,000 lb. and need not be dragged into position. Reports indicate that American Ordnance is far ahead of the Germans in achieving both lightness and portability for both the projectile and its firing apparatus. Many concerns are likely to participate in the expanded procurement program, and Revere will add from 30 to 50 subcontractors for the hitherto secret weapon.

Surplus Planes Sold

WASHINGTON—Of 11,450 surplus government-owned planes available for sale to private individuals and groups by the Defense Plant Corporation, 2,376 have been sold. Included are basic, primary and advance trainers, as well as gliders, fighters and bombers.



Glass Bearings—Tiny jewel bearings are required for electrical instruments so as to reduce friction to a minimum in the delicate mechanism. At the Newark plant of the Westinghouse Company, this operator checks the temperature of a hydrogen flame. The glass rod is fed by motor drive into the punch press which forms precision jewels. Millions of these tiny jewels are needed to supply the enormous war demand

Report Truck Bookings

CHICAGO—Domestic Bookings of electric industrial trucks and tractors during the month of April, 1944, totalled 119 units according to figures just released by the Industrial Truck Statistical Association.

Wartime Washington

Split Over Civilian Output

WPB's failure, as this issue goes to press, to issue orders allowing manufacturers to place orders for machine tools, dies, jigs and other equipment necessary for civilian production, lies at the heart of a new struggle for control of war and non-war production which is raging in Washington.

WPB Chairman Donald M. Nelson, who on June 19 directed issuance of such an order, as well as issuance or orders allowing manufacturers to obtain enough material for one working model of any postwar product and also discarding strict limitations on use of magnesium and aluminum, is aligned in the new struggle against his old foe, the armed services, but this time, the circumstances are somewhat different. For one thing, an imposing number of Wilson's own top people in WPB are siding with the services, while Nelson's chief support is drawn from Congress, which did not figure tremendously in previous battles for control of war production.

Say Unemployment Created

Sen. Harry Truman, head of war program investigating committee, dragged into public view a charge which has been circulating in Washington for months . . . that the services are trying to bar any boost in civilian production so that, as cutbacks occur, pools of unemployed will spring up which will be serious and widespread enough to settle once and for all the problem of inducing workers to leave their homes for necessary, albeit undesirable, jobs in the war programs which have gone begging. Truman put this charge bluntly, adding that certain "selfish business groups" which don't want competitors to get a head start on them in civilian production also are holding up the limited reconversion which Nelson espoused last month before Truman's committee.

Oppose Nelson Program

Truman's blast, seconded by Sen. James Murray, chairman of the Senate's Small Business Committee, was hardly public before the services retorted that any program such as Nelson's might prolong the war. The reply came from the Joint Chiefs of Staff, one of Washington's most powerful agencies, and was signed by Admiral William D. Leahy, chief of staff to the President, indicating that Nelson's opposition is far from minor-league in character.

Nelson, who was hospitalized with pneumonia shortly after announcement of his limited reconversion program, apparently was opposed in his own organization by its most imposing people, including Executive Vice Chairman Charles E. Wilson and vice chairmen A. H. Bunker, Lemuel R. Boulware, William L. Batt, William Y. Elliott and several others. Reportedly, Nelson mustered the support, among his vice chairmen, only of Maury Maverick, chairman of the Smaller War Plants Corp., Clinton Golden, CIO leader in charge of Manpower Requirements, and Joseph Keenan, AFL leader in charge of labor production.

And It Comes Out Where?

A WPB official told AMERICAN MACHINIST that the order allowing the purchase of tools needed for postwar production has been circulating in WPB for some time, that it had been expected out during the first week in July and that it "could" be out during the second week of the month. He declined flatly, however, to give the least inkling of its details, remarking that too many pronouncements scheduled for issuance fail ever to see daylight.

Differ Over Sufficiency

Truman and the Joint Chiefs of Staff split sharply over the issue of whether war production is meeting the needs or whether it is not. Truman said the services have obtained or are certain of obtaining sufficient materiel. The Chiefs of Staff expressed disturbance over the existing production lag, "which, if it continues, may necessitate revision in strategic plans which could prolong the war." This split points up a feeling which has been growing recently that someone is kidding the public with relation to the arms program. Figures showing that this and that program are behind schedule are released, apparently in all good faith. Yet there is considerable readily-obtainable "inside information" which indicates that some of the programs allegedly behind schedule, to the implied detriment of the war, are actually turning out material at rates which the receiving services are unable to consume.

While it seems ridiculous on its face to compare "inside information" obtainable in a gossp center like Washington with information formally released and attributed to a responsible public agency, the fact remains that in many cases, today's "inside information" is tomorrow's handout. Further, agencies which have a special cause to plead have been known to issue formal statements, for attribution, which do a less than candid job of telling the entire story.

Proposes Termination Plan

Use of termination control centers staffed by "settlement teams" of accounting, disposal, legal and technical officers is the proposal of a National Association of Manufacturers advisory group. The group also suggests direct settlement with subcontractors by the procurement agency where "suitable releases" between buyers and sellers can be arranged without destroying contract identifications.

British Combine

Mine Beater—The new flail tank, now operating in Normandy, whirls chains before it to detonate land mines. This type of tank is known as the "Crab"

Spotting the Air News

Robot Won't Stretch War

Germany's flying bombs will have little if any effect on the duration of the war. When Churchill reported on them, he said that they had killed only one person per bomb, which is a poor showing in destruction.

But the winged missiles do have important implications for the future; they stand a good chance of becoming major weapons. Not that they are new; thousands of air-minded tinkerers have had the idea, and Kettering, of General Motors, filed a patent claim on one long ago. But the desperate Nazis brought it into production.

1—The bombs are demonstrating the feasibility of jet propulsion for unmanned flying weapons. 2—Such missiles can be made in almost any size, to carry large loads of explosives, shrapnel, poison gas, or chemical fire. 3—They can be accurately aimed at long range by (a) pilots who would bail out close to the target; (b) by electronic control, already in use, from a "mother" plane following a formation of bombs; or (c) they could be made automatically to follow radio beams such as are now in use on scheduled airlines.

Inaccuracy is Cumulative

The present Nazi winged bomb is navigated by a robot (gyroscopic) pilot or "iron mike" like those used on steamships and airliners to hold course with intermittant correction. There is in this system an element of cumulative error which, if the robot is left uncorrected, cuts down its accuracy as the range increases. At 50 miles, roughly the distance between the launching platforms and London, they can get within a ten-mile bracket. In other words, the possible error in deflection is about one mile for each five miles of range, which is not so good.

It is incorrect to call the flying bombs "rocket bombs." These bombs are jet propelled. A jet engine burns a large volume of air with its oil fuel, just as internal combustion cycle engines do, and its thrust is largely reaction from the impact of hot air and gas from the jet against the body of air.

Rocket power is different. The rocket's mixture of oxygen and chemicals which it burns is sealed up in the rocket's magazine. It needs no air to burn. Part of its thrust is pure reaction from the continuing explosion—equal and opposite reaction known to all students of physics. Therefore it could fly in a vacuum, or beyond the atmosphere. But when the fuel in its magazine is burned out, it's done. The jet engine, on the other hand, can function as long as it receives fuel from the tank, to mix with air. Rockets, so far, are useful only for a few moments as airplane takeoff boosters. When burned out, they are dropped, and may be reloaded.

Jets Better Suit Nazis

The Germans have jet power probably as well developed as that of the British and the United States, and the U. S. Army has observed signs that the enemy may soon use it. The high speed and high altitude of jet-powered planes would be a big advantage to the Luftwaffe, and so would the low grade fuel requirement—it can be almost anything that burns rapidly. Generals Marshall and Arnold have both said recently that the Nazis are already in a serious oil shortage. The short range of jet power is a serious handicap to its use by the Allies, but the Germans can use it because their air war from now on will be one of interception—usually a half-hour job.

Luftwaffe Power Wanes

But it is doubtful if the Germans can stay in the air, in force, very much longer. Their oil production has been cut to about 40 percent of normal, and their aircraft replacement is falling far short of losses. In recent weeks, more than 100 Nazi warplanes are seldom seen in one place. Whatever is left of the Luftwaffe will surely be knocked out when the Allies occupy land in France and elsewhere close enough for medium bombers and fighters to cover the Reich, fully loaded. Thus far the fighters, accompanying bombers deep into Germany, have been loaded mostly with fuel, plus guns and ammunition. As the Luftwaffe grows weaker, Germany will switch more and more from air defense to anti-aircraft gun fire. This will increasingly release Allied fighters from bomber escort duty. The P-51s, P-38s, and P-47s can carry 3,000 and 4,000 pounds of bombs, or tremendous charges of ammunition with which to beat up anything they come upon. Thousands of these fighters, and medium bombers, will be available to add their sting to the enemy's ordeal.

Notes for Your Book

Big-name manufacturers, released from war work, are enticing brilliant men away from those still fully occupied on war contracts, with good salaries and attractive postwar careers . . . The new Joint Research Committee for Army and Navy will cover the field of war weapon development in peacetime, leaving aviation to the National Advisory Committee for Aeronautics.

Graph of Axis Decline—While a dorsal fin for the Army's new B-29 superbomber awaits riveting of its clomp-held skin, it has the appearance of a thorn-studded three-dimensional graph detailing the decline of the Axis

Taxation Adjustment Program To Boost Reconversion Plans

OTTAWA—Canadian industry would be given a chance to finance reconversion, without impairment of present tax collections, under the provisions of a carefully worked out pattern of taxation adjustments now before parliament in Finance Minister James L. Ilsley's budget legislation.

Avowed purpose of the tax pattern is to allow industrial companies to salvage a part of their wartime profits from the tax collector to finance new plant installations, deferred maintenance and repair expenditures, outlays on research projects connected with postwar operations. They also would be allowed to balance some of their losses on operations in the changeover period against wartime profits which otherwise would be consumed in the dominion's 100 percent excess profits tax.

Under the budget legislation, firms would be allowed to (1) charge losses in the first postwar year either to profits in the last war year or to profits in the three years following the year of loss; (2) charge half of the cost of deferred maintenance and repairs to earnings made in war years back to 1942-43; (3) vary depreciation allowances on new plants so that part of the cost will come out of wartime earnings which otherwise would accrue to the treasury in excess of profits taxes; (4) spread the write-off on research plant for postwar use over three years including the current war year. Big help to companies is the provision for their assigning of refundable excess profits tax accumulations in the hands of the treasury as security for reconversion loans. Under the excess profits law, 20 percent of excess profits taxes are refundable two years after the end of the war. Industrial companies did not figure this credit would be much use in reconversion—some were skeptical about its ever being recovered.

In addition, Canadian business now has Ilsley's definite assurance that excess profits taxes will be dropped entirely after the war.

Issue Termination Guide

WASHINGTON—Major questions confronting war contractors are answered in a new booklet for both prime and subcontractors, "The Contractors Guide," pending publication and details of which were announced in AMERICAN MACHINIST, April 13. Written in nontechnical language and graphically illustrated to emphasize salient points, the booklet is intended to simplify action and promote speedier settlements of terminated contracts. Copies are available from War Department procurement offices throughout the country. The work is the result of months of experience and study.

Names in the News

W. K. Hyslop has been elected president of the Massey-Harris Co., Racine, Wis., to succeed **James S. Duncan,** who has become chairman of the board, and will continue as general manager. **J. M. Tucker** has been appointed vice president and assistant general manager while **C. E. Krause** has been named secretary and manager of manufacturing, with L. M. Sweeney as sales manager and L. W. Petersen, assistant treasurer.

W. K. Hyslop

C. F. LaMarche

C. F. LaMarche, former vice president and general manager of American Malleable Castings Co., Marion, Ohio, has been named president and general manager of the Marion Steam Shovel Co. Mr. LaMarche has been a director of the Steam Shovel Co. since 1939 and is an official of several other companies.

K. R. Van Tassel, sales manager of the integral-horsepower motor section of General Electric's motor division, Schenectady, for the past two years, has been appointed manager of the industrial control division in the company's industrial divisions to succeed **George R. Prout,** was recently appointed manager of the GE air conditioning and commercial refrigeration division, appliance and merchandise department.

D. E. Batesole has been elected vice president and chief engineer of the Norma-Hoffman Bearings Corp., Stamford, Conn. Mr. Batesole has been a member of the firm's engineering department for over 25 years and chief engineer since 1937.

Clarence E. Baittinger has been appointed vice president in charge of research and engineering and **J. Howard Shain** has been appointed production manager of the Penn Metal Corp., of Penna.

Paul H. Setzler has joined the engineering staff of The United Welding Co., Middletown, Ohio, as consulting engineer after several years of engineering background in the field of welding.

Frank W. Shipley has been appointed foundry manager of the Caterpillar Tractor Co., Peoria, Ill., following the retirement of **M. J. Gregory** as factory manager of the foundry division.

C. B. Campbell has been named manager of engineering of the steam division of the Westinghouse Electric and Mfg. Co., Philadelphia, Pa. to succeed **Floyd T. Hague,** who has been appointed assistant to the vice president.

Max Powell has been appointed vice president in charge of technical research for the Harvill Corp., Los Angeles, Calif., but will retain his duties as head of standard controls and chief metallurgist.

H. T. Youngren

J. F. Wolfram

Harold T. Youngren has been appointed director of engineering development of Borg-Warner Corp. Mr. Youngren has been chief engineer of the Oldsmobile division of General Motors Corp. for eleven years and has held various positions with auto and aircraft manufacturers. **J. F. Wolfram,** a member of the Oldsmobile division for the past 16 years, has been named chief engineer of that division to succeed **H. T. Youngren.**

E. R. Galvin, general sales manager of the R. G. LeTourneau, Inc., has been elected to succeed **John K. Colgate** as president of the Tyson Bearing Co. The new president has been with LeTourneau since 1938 and prior to that time was general sales manager of the Caterpillar Tractor Co. Mr. Colgate has been named board chairman.

E. G. Gardner and **James F. Howard** have been named vice presidents of the National Enamel and Stamping Co., Milwaukee, Wis. Mr. Gardner has been with the firm since 1939 and will be in charge of manufacturing in the company's plants. Mr. Howard has been with the company for 18 years and will continue in his former capacity as secretary and treasurer of the firm.

A. C. Teetsel, who has been connected with the automotive industry since 1920, has been appointed manager of friction materials manufacturing for the Thermoid Co., Trenton, N. J.

H. H. Fuller has been elected vice president in charge of the west coast steel activities of Bethlehem Steel Co., to succeed **W. H. Stewart,** who is retiring. Mr. Fuller has been with Bethlehem for about 25 years in various capacities.

H. H. Fuller

J. B. Ennis

Joseph B. Ennis, senior vice president of the American Locomotive Co., has been awarded the George R. Henderson Medal by the Franklin Institute "in consideration of his accomplishments in locomotive engineering and important contributions in the field of locomotive design."

M. J. Zivian, who has been with the Detroit Steel Co. since its formation in 1923, has been named president of the company, while **Robert D. Kelley** has become president of the Craine-Schrage Steel Co., a Detroit Steel subsidiary.

A. E. Rhoads, former manager of the Kuhlman Electric Company's Detroit electric furnace division, has been named executive vice president and general manager of the Bay City, Mich., company.

Henry R. Metz, former works manager of the Eismann Corp., Brooklyn, has been appointed vice president in charge of operations of the company, while **Lloyd H. Scott,** former chief engineer, has been named vice president in charge of engineering.

Frank L. Ross, manager of the eastern division of the Hyster Co. at Peoria, Ill., has been named vice president and director of the company. Mr. Ross will continue his former activities in his new capacity. **Eugene Caldwell,** general manager of the company, has also been elected vice president of Hyster.

Ronald J. Sweeney, industrial engineer, has been appointed director of research for the Stover Lock Nut and Machinery Co., with offices in the Easton, Pa. plant of the firm.

BUSINESS ITEMS

As a manufacturers' representative serving the industrial and automotive trades, **Ed J. Butler** has opened offices at 277 Seventh St., San Francisco, Calif.

F. F. Barber Machinery Co. has been appointed Canadian representatives of the **Eastern Machine Screw Corp.,** with offices in Toronto, Windsor and Montreal.

Ampco Metal, Inc., Milwaukee 4, Wisconsin, has built a new plant at 30 East Burbank Blvd., Burbank, Calif. to serve West Coast customers. Customers will be served by the same personnel formerly connected with the **Hollywood Aluminum Products Div.** of Ampco.

Peerless Stove Co., Columbus, Ohio, has acquired the properties of the **Easiest Way Mfg. Co.** in Sandusky, Ohio, where facilities will be installed shortly.

American Chain & Cable Co., Bridgeport, Conn., has acquired the business of **Pennsylvania Lawn Mower Works, Inc.,** Primos, Pa.

National Motor Bearing Co. of Redwood City, Calif. and Van Wert, Ohio, has purchased the **Arrowhead Rubber Co.** of Los Angeles, Calif. to insure an uninterrupted supply of synthetic rubber for the company.

Taller and Cooper, engineers and manufacturers, have moved their plant and executive offices to 75 Front St., Brooklyn 1, N. Y.

OBITUARIES

Frank R. Frost, 61, president of Superior Steel Corp., Carnegie, Pa., died June 29 after a lengthy illness. Mr. Frost joined Superior in 1917 and has been president since 1927.

D. C. Green

Daniel C. Green, 59, chairman of the board and chief executive officer of the Cleveland Pneumatic Tool Co., died July 2. Mr. Green has been active in the public utility field and had accepted the position with the Tool Co. as a war assignment in 1942. Under the supervision of Mr. Green, the company's subsidiary, the Cleveland Pneumatic Aerol, Inc., was formed about a year ago to manufacture aircraft landing gear.

Emanuel J. Lombard, 59, superintendent of the Mercer Tube Co., Sharon, Pa., passed away June 13.

William H. Crosby, 81, chairman of the board of the Crosby Co. which he founded 48 years ago, died June 26. Mr. Crosby served as president of the company until 14 years ago and at the time of his death was chairman of the board of the Barcalo Co. and vice president of the Molin Corp.

Sylvester W. Kirk, 63, president of the Kirk & Blum Manufacturing Co., Cincinnati, Ohio, died June 10 in Coral Gables, Fla.

Herbert O'Leary, one of the world's small-arms authorities, passed away July 2 at the Walter Reed Hospital in Washington. Col. O'Leary served for many years as chief of the small arms division at the Office of the Chief of Ordnance and more recently was ordnance officer of the Second Service Command, Governor's Island, N. Y.

Joseph W. Harrison, 82, founder and president of the Harrison Steel Castings Co., Attica, Ind., died June 27. He had been connected with foundries for 68 years in United States and England. The Harrison Co. is one of the larger steel casting companies in the country.

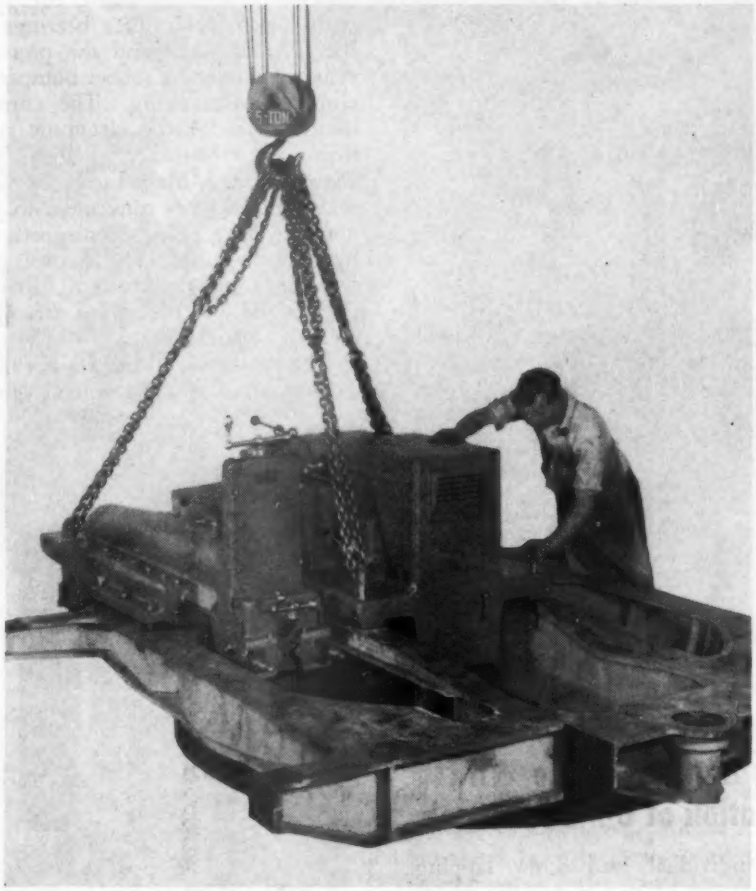
MEETINGS

National Tool & Die Manufacturers' Association Annual Meeting. Statler Hotel, Buffalo, N. Y., Sept. 28-30.

Silver Bay Association, Silver Bay Industrial Conference. Lake George, N. Y., July 26-29.

Society of Automotive Engineers. National Tractor Meeting. Schroeder Hotel, Milwaukee, Wis., Sept. 13-15.

Shop Equipment News

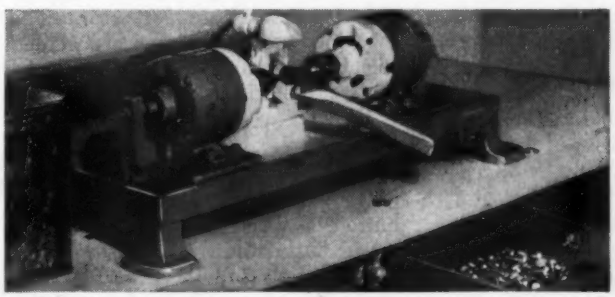


Rockford Hy-Draulic shaper

Hy-Draulic Shaper by Rockford Machine Tool Company Machines Inside Gun Mount Weldment, Replaces Planer

Rockford Machine Tool Co., 2500 Kishwaukee St., Rockford, Ill., has designed and built a Hy-Draulic shaper for machining two surfaces on the inside of the welded steel base for a gun mount. This job formerly required a large openside planer. While it is intended for a single purpose, this machine demonstrates the facility with which standard Hy-Draulic machine tool designs and elements can be applied in a variety of special ways to speed production.

The Hy-Draulic shaper is swung into place on the gun mount base by the shop crane, attached by slings to three eyebolts in the base of the machine. By locating-pins the operator is able accurately to position it on the weldment, after which he tightens heavy hold-down bolts and jack screws for rigidity.



Mercury countersinking machine

Federal Adds New Units to Its D.C. Power Supply Line

Selenium rectifier power supply units of 1, 5 and 10 amp. at 115 v., d.c., designed for use in the operation of magnetic equipment, d.c. motors, relays, circuit breakers, carbon arc lamps, battery chargers and other application have been added to the line of power supply equipment manufactured by Federal Telephone and Radio Corporation, Newark, N. J.

The new units are designed for wall or bench mounting with no special connections needed. They are equipped with a 6 ft. input lead with male connector and a standard convenience receptacle for the output. The 10 amp. unit is furnished with an 11-point selector switch for maintaining 115 v. at any load.

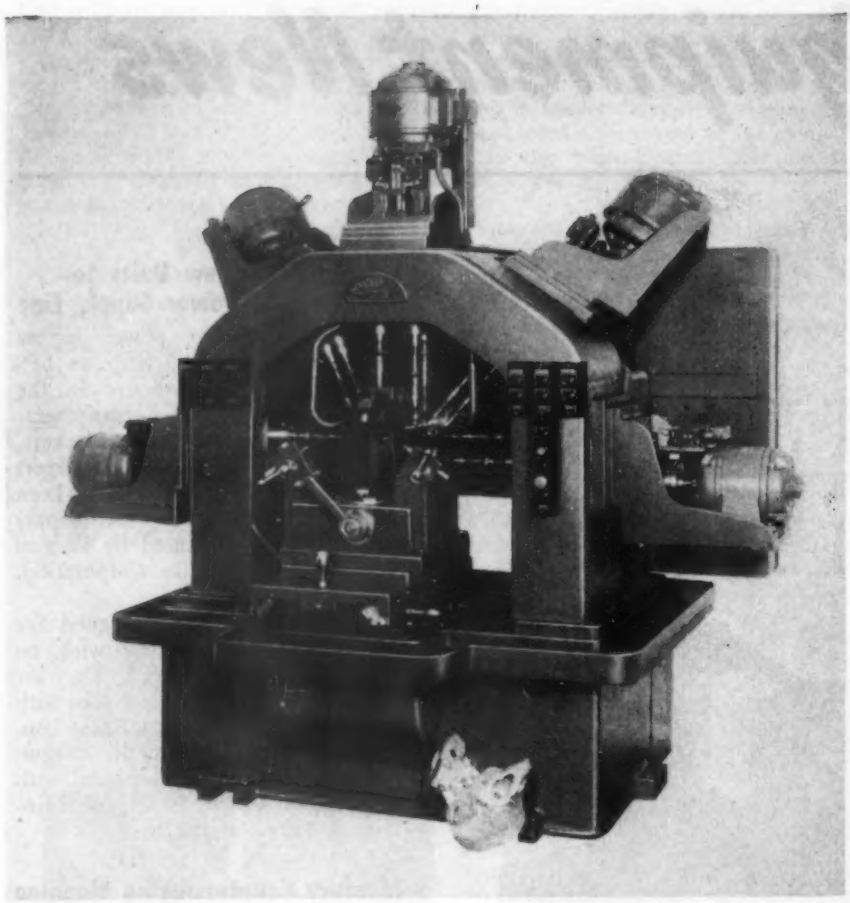
Mercury Countersinking Machine Does 3,000 Operations Hourly

Mercury Products Company, 423 Euclid Ave., Cleveland 14, Ohio, has developed a countersinking machine that, according to the manufacturer's announcement, is stripped of non-essentials.

Features of this new machine are the heavy cast iron base, No. 8½ Jacobs super chucks, heavy tool post for strength and rigidity, heavy duty switch, optional knee control or floor pedal, high intensity work light over workrest, tool post micrometic adjustment for depth and height and end micrometic adjustment for depth of countersinking.

The scientific color finish was adopted after it proved to give maximum light refraction for operating efficiency.

The Mercury countersinking machine is 28½ in. long, 10½ in. wide and 11 in. high over the top of the work light. It weighs 70 lbs. (approximately 90 lb. crated for shipping). It has but two rotating members and a tungsten alloy work rest.



Snyder multiple direction tapping machine

Snyder Multiple Direction Tapping Machine Made With A Varying Number and Combination of Units to Fit Job

A multiple direction tapping machine for tapping aircraft cylinder heads, designed and built by Snyder Tool and Engineering Company, 3400 E. Lafayette Ave., Detroit 7, Mich., is made with varying numbers of tapping units and various combinations of single and multiple spindle heads, depending upon the requirements of the specific job.

With the ball-bearing mounted fixture table in the forward loading position, the work part is located by plungers entering rockershaft holes and is clamped by means of a cam-action lever. While fixtures and table are in this loading position the safety switch cannot be closed and therefore, the machine cannot be cycled. The entire fixture and its slide are then rolled into working position, located accurately by an index pin entering the table, and locked in place. This action closes the safety limit switch and permits the tapping units to be sent through a working cycle.

The tapping units are developed for individual lead screw tapping and consist of two parts—the motor mounting bracket and the first reduction gear unit, including limit switches and controls. That part of the unit is identical in all cases, regardless of the number of tapping units on the machine. The head of any tapping unit may carry one, two, three or four lead screw spindles, depending upon requirements of the work to be performed.

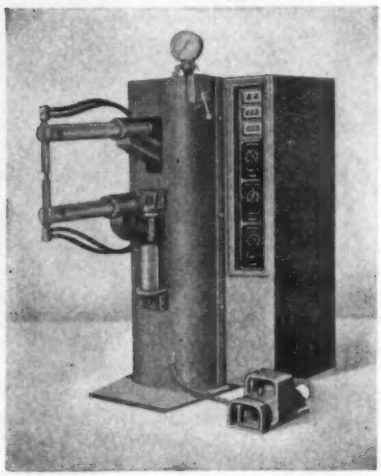
The leadscrew spindles are hardened and ground sleeves operating in bronze bushings which are adjustable to compensate for wear. The machine base and column are welded steel. The coolant tank is equipped with a motorized coolant pump.

For set-up purposes, each head has an individual push button which operates that single head forward as long as the operator presses the button. When forward position is reached, the limit switch stops forward motion and the operator must press the return button until the spindles are fully retracted.

Sciaky Rocker Arm Spot Welder Electronically Controlled

A small self-contained unit rocker arm spot welder, employing features usually found only on larger machines, is offered for production sheet metal work by Sciaky Bros., 4915 W. 67th St., Chicago 38, Ill. The upper arm of the welder is equipped with heavy duty roller bearings at the fulcrum point and the pressure cylinder contains a rubber bumper to eliminate hammering. The current interruption for the electronic controls and contactor, which are mounted in a hinged cabinet with dials and switches convenient to the operator, may be either magnetic or by ignitron tubes. The controls for welding heat, duration of current, cool period and off period are operated automatically.

The welder is rated 30 KVA at 50 percent duty cycle with a capacity on mild steel up to two thicknesses of 0.080 in. and on stainless steel of 0.040 plus 0.040 in. The speed on two thicknesses of 0.032 in. pickled mild steel is 180 spots per minute and the electrode pressure at 24 in. throat depth is 1000 lbs.



Sciaky rocker arm spot welder

Industrial Thumb and Two Finger Guard Saves Gloves

For punch press operators, employees handling sharp, jagged small castings, stampings, etc., the standard thumb and two finger guard of chrome leather has been reinforced with steel ribbons by Industrial Gloves Company, Danville, Ill. Placed vertically and staggered, this type of reinforcement protects the wearer and boosts handguard's wear.

...Eliminates CUT and TRY

MAKES SET-UPS AMAZINGLY SIMPLE

Determining the exact diameter and length of a work-piece being machined on a Lodge & Shipley Lathe is a matter of easy reading. Micrometer Dials and Counter Arrangements (Figs. 2 and 3) for either length or diameter, after being properly set, indicate when the exact dimensions desired are attained.

These Direct Reading Dials and Counters can be used with extreme accuracy and efficiency when changing from large to small diameters or the reverse—in turning, boring, facing and other lathe operations.

On lathes equipped with multiple length stops (Fig. 1), settings for step jobs can be accomplished quickly. After the first stop dog has been set, the correct settings for the balance of the stop dogs are made, using the Length Dial on the apron (Fig. 2) to determine exact shoulder positions.

The stop dogs, used in conjunction with the Dial and Counter, automatically disengage the feed at each shoulder. The apron lever (Fig. 1) when raised reengages the feed after the tool is set for the next required diameter. In this manner, successive cuts are accurately established with minimum effort.

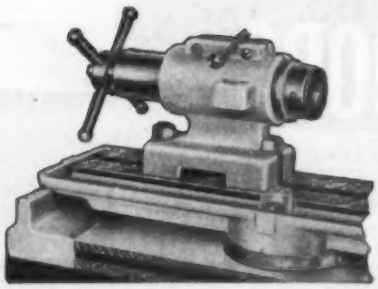
These and other Lodge & Shipley developments—to simplify lathe operation—permit important time savings, reduce spoilage and lower costs whether the operator is a beginner or experienced. For more complete details call on Lodge & Shipley Engineers or write on your company letterhead for booklet No. 495-B.

THE LODGE & SHIPLEY MACHINE TOOL CO.

CINCINNATI 25, OHIO, U. S. A.

L & S LATHES

ENGINE • AUTOMATIC • TOOL ROOM • OIL COUNTRY LATHES



Lee tap grinding fixture

Lee Tap Grinding Fixture For Use on All Tool Grinders

The K. O. Lee Company, Aberdeen, S. D., is now in production of a new tap grinding fixture, adaptable to any make tool grinder. Described as compact, sturdy and handy, the unit maintains maximum accuracy on taps through the use of collets. This fixture is built to accommodate taps from No. 8 to 2½ in. in dia.

All grinding operations necessary on taps can be accomplished with one set-up. T-slot blocks to fit any make of tool grinder will be furnished on request.

Sheffield Offers Standard Size Precisionaire Spindles

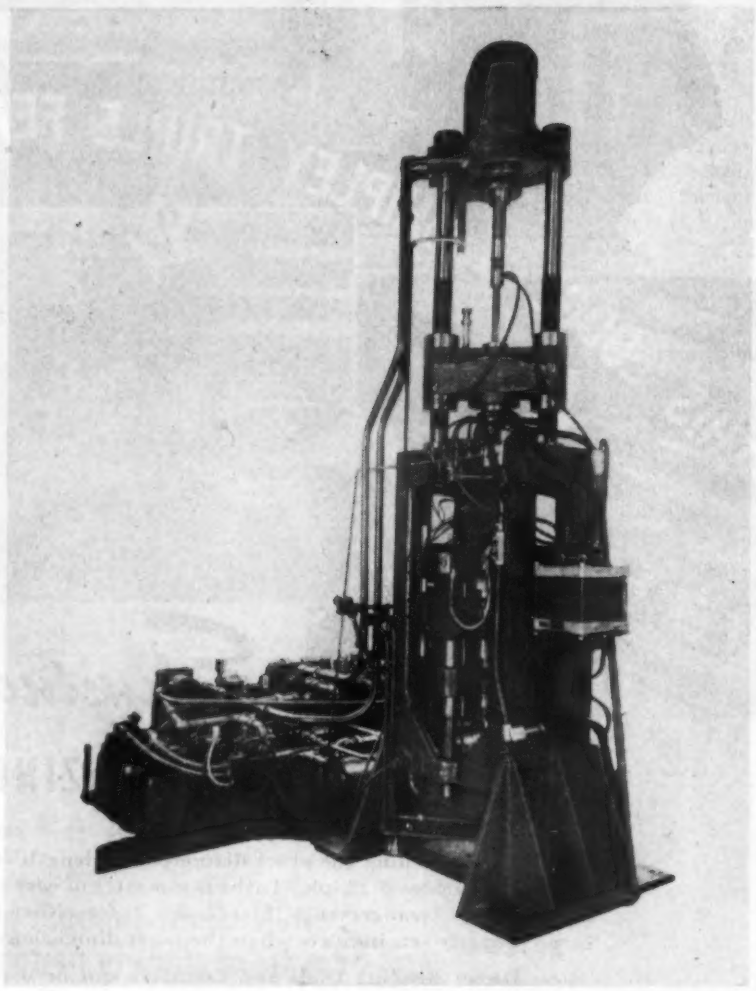
Type and size standards of air gage spindles for dimensional inspection of internal diameters and bores of "through" and "blind" holes, ranging in diameter from 0.300 in. to 1.734 in. with tolerances from 0.005 in. to 0.000050 and less, have been established by The Sheffield Corp., Dayton, Ohio.

Four types of standard spindle assemblies are available. Type A or A-1 assembly is used where the gage is presented to the work. Type B or B-1 is used where work is presented to the gage.

A and B are designed for checking "through" holes, "A-1" and "B-1" for blind and counterbored.

Sheffield precisionaire spindles

Lester Plastic Injection Molding Machine Horizontal Platens Facilitate Production and Ease Die Changing



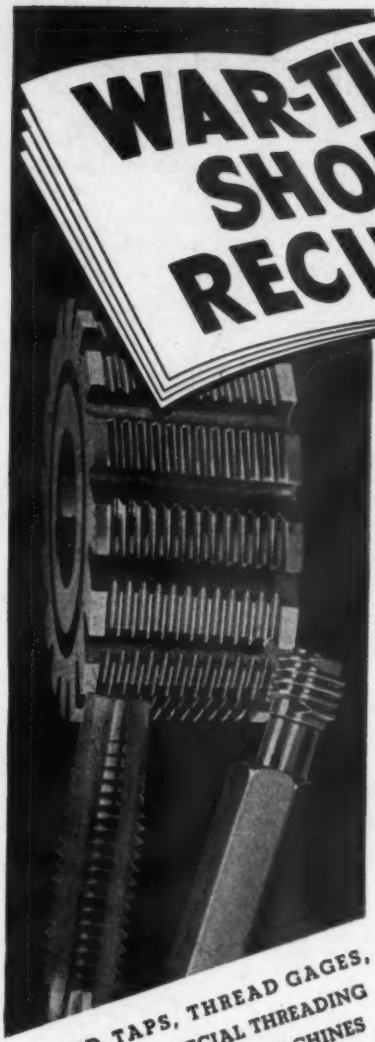
Lester injection molding machine

A new injection molding machine for plastics, which performs (1) injection molding of thermoplastic material; (2) injection molding, by the "jet" process, of thermosetting material and rubber compounds; and (3) injection molding of electronically heated pre-forms in plastics or rubber, has been designed by the Lester Engineering Company for Lester-Phoenix, Inc., 2711 Church Ave., Cleveland 13, Ohio.

This new press, Model 3V-12, is built in a vertical design with horizontal die platens, facilitating the production of castings having inserts which must remain fixed in position and making easier the changing and mounting of dies.

In both jet molding and injection of electronically heated preforms, the cycle time is reduced to a fraction (ranging from one-half to one-fiftieth of that required by previous methods). Since dies are closed during injection cores are not bent, inserts are held in position. Dies last longer. Castings, being uniformly cured throughout, are stronger.

The machine is self-contained, having a 30 hp. motor, hydraulic equipment and electric timing controls on a separate base. The frame is of molybdenum cast steel, providing 400 tons die clamping pressure. The movable die platen, free of bars, is 21 × 25 in. and moves on "V" slides in hardened inserts. Central die support and die height adjustment are accomplished through a single large Acme thread screw; turning a hand crank rotates the screw through worm and worm wheel. Die opening and closing is by hydraulically actuated double toggle linkage, provided with hardened cam and wedge locks to insure rigid metal-to-metal die support.



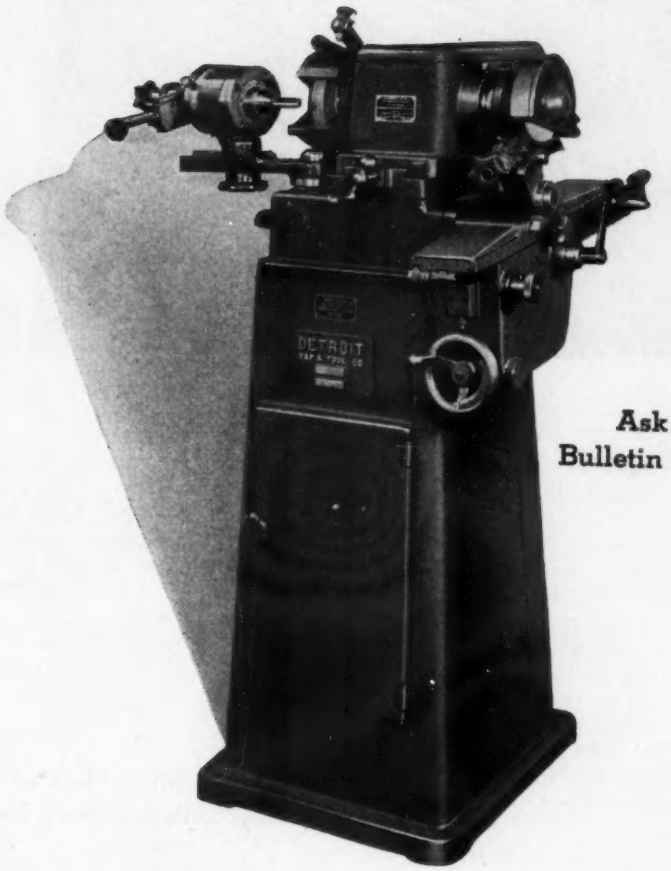
WAR-TIME SHOP RECIPES

GROUND TAPS, THREAD GAGES, THREAD HOBS & SPECIAL THREADING TOOLS. SPECIAL TAPPING MACHINES

3 in 1 4 in 1

DETROIT

TAP RECONDITIONER



Ask for Bulletin #DTR-3

Again improved to still further increase flexibility and usefulness, the Detroit Tap Reconditioner will:

1. Grind Chamfers on 2 to 7 flute taps
2. Grind Flutes on 2 to 6 flute taps
3. Grind Spiral Points on 2 to 6 flute taps
4. Polish Spiral Points on all types of taps

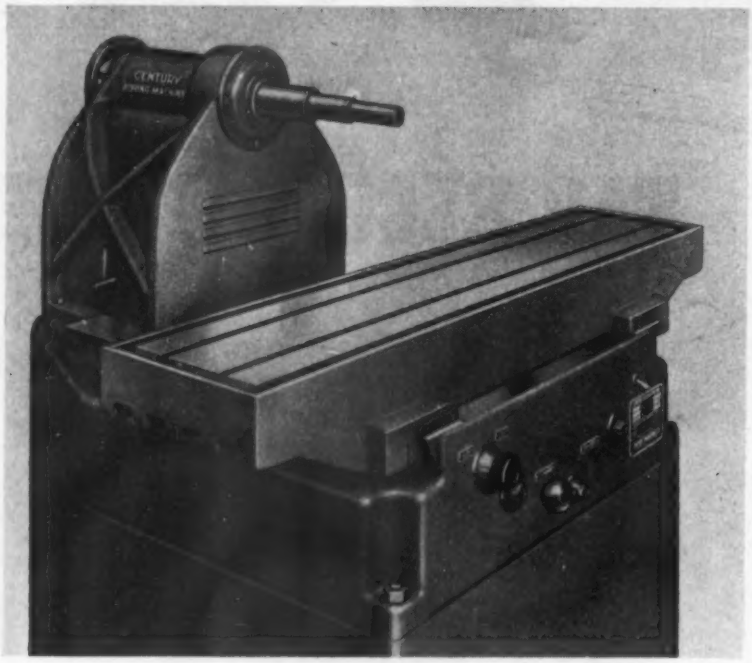
Among other important improvements are still better sealing of working units against grinding dust, ability to use interchangeable collets for chamfering, flute grinding and spiral pointing, belt-cushioned motorized drive for maximum smoothness, etc.

BUY U.S. BONDS STAMPS

DETROIT TAP & TOOL CO.

8432 BUTLER
DETROIT 11,
MICH., U. S. A.

Century Boring Machine, Designed to Finish Bore Holes To 2½ in. Diameter, Is Adaptable to Special Set-Ups



Century boring machine

The model RC precision boring machine manufactured by Century Engineering Co., 5529 S. Vermont Ave., Los Angeles 37, Calif., is designed to finish bore holes up to approximately 2½ in. dia. and lends itself to special applications and set-ups. The working surface of the table is 6¼ in. × 33½ in. The table moves on dovetailed ways provided with an automatic oiling system. The table has two 11/16 in. wide T-slots running the full length and a coolant trough around the outside edge.

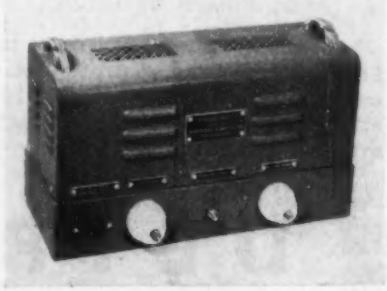
The center line of the spindle is 6⅜ in. above the table. The spindle has four pre-loaded, precision ball bearings and a No. 5 Morse taper. The three-step pulley operates the spindle at 650, 1300 and 2450 r.p.m. when using 60 cycle current. The 1/3 hp. 110-v. motor is mounted on a hinged plate which maintains the proper tension on the B-belt and simplifies belt shifting.

The air-hydraulic feed mechanism has all controls located in front of the machine. The boring feeds are variable through a wide range and are accurately controlled by a metering valve of unique design. A second metering valve can be supplied to control the return movement of the table so that the forward stroke can be used for semi-finish cut and the return stroke for finishing. The feed mechanism operates on 90 to 125 lb. of air.

Use of a second, hand operated-slide, moving on dovetailed ways, provides a cross, as well as a longitudinal, movement for the table. This slide may also be equipped with a dial indicator and V-blocks so the table can be accurately indexed by using space bars.

Trignitrol Takes Place of Mechanical Welding Switching

The Trignitrol, an electronic switch designed to supersede mechanical switching on capacitor welders, is being produced by Electronic Power Company, 18 West 44, New York 18, N. Y. According to the company's announcement, it is a silent, positive-acting, economical switch which instantly and completely discharges the condenser bank through the welding transformer. This instantaneous peaked discharge welds with a minimum damage to metal grain structure and no burning of surrounding metal, while total capacitance required is substantially lowered.



Electronic Power Company's trignitrol

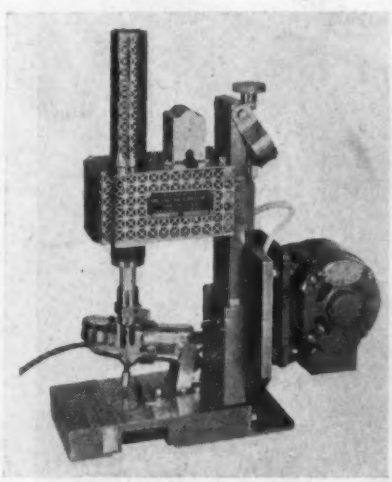
A new mercury pool conduction tube, the Trigniton, is utilized by this electronic switch; it is fired capacitively by a low power trigger circuit, and is said to be immune to flashback and oscillatory discharges, while expensive preventative circuits are not required.

Only four simple connections are required for immediate installation. Power supply is standard 110 or 220 v., 60 cycle a.c.

York Tool Develops Martin Designed Hardness Tester

A mechanical device for testing and automatically certifying the hardness of sheet metal parts, designed by Glenn L. Martin Company, is being built by York Electric Tool Company, 52 S. Duke St., York, Pa. The device eliminates visual inspection. It electrically certifies and marks each piece being tested. Materials not being marked are rejected as not meeting specifications.

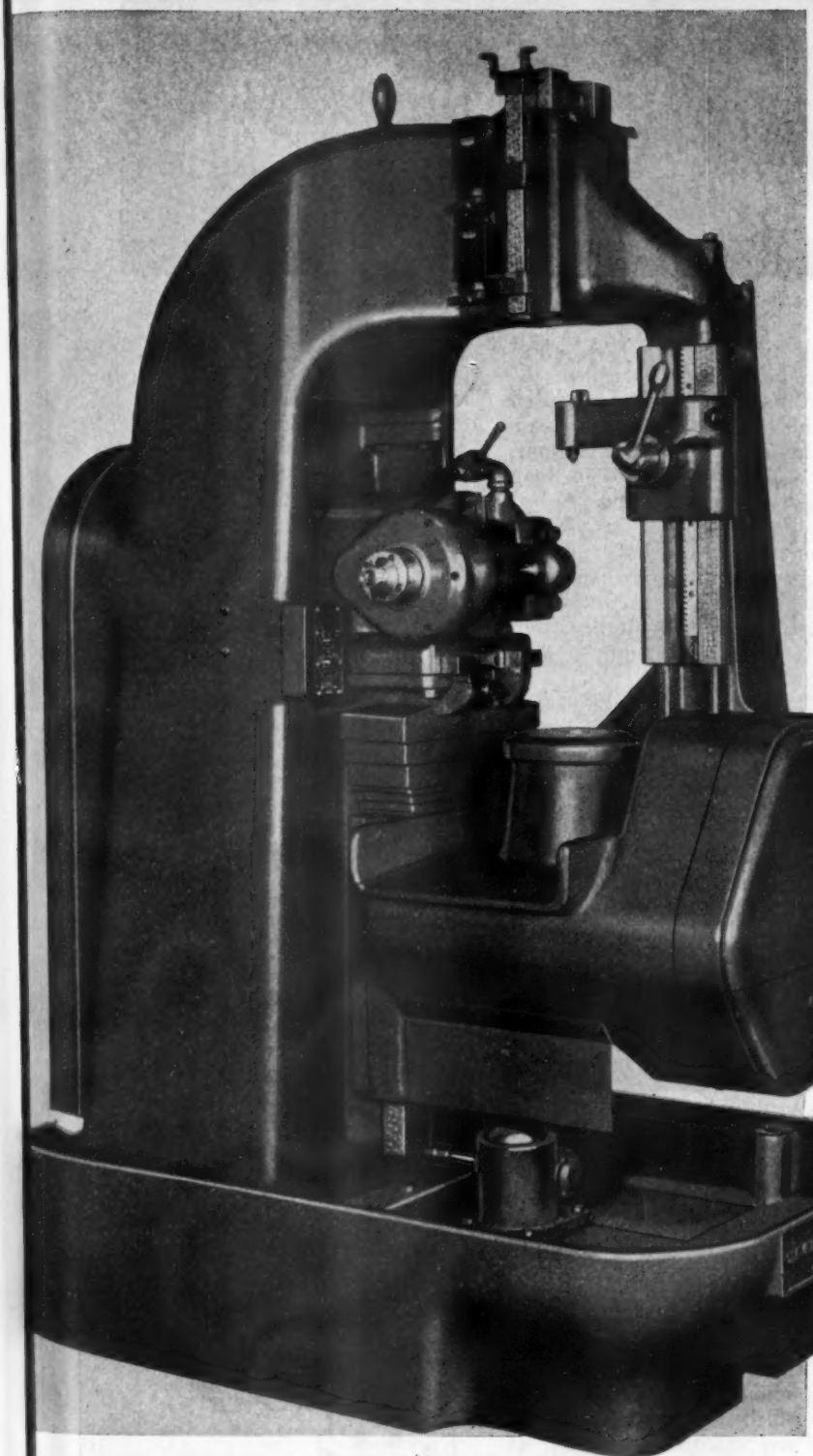
This machine has facilities to accommodate certification and inspector's dies in the same operation. It identifies the operator, thus assuring more accurate operation. The tester has a meter counter which keeps accurate account of pieces inspected, but does not count those rejected.



Hardness tester and certifier

For fast accurate Hobbing of Gears and Splines

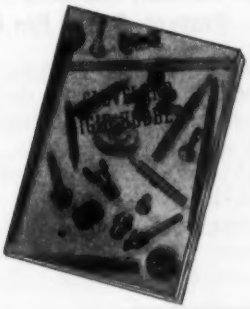
THE RIGIDHOBBER



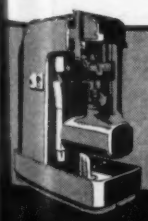
● The Rigidhobber presents a high production method for the accurate duplication of spur and helical gears—straight and helical splines.

The rigid support to the workhead both above and below work eliminates spring in either work or hob and assures dependable precision of both gears and splines.

A Cleveland Hobbing Engineer will gladly show you the many advantages of the Rigidhobber both from standpoint of production and application to your work.



The Bulletin tells all about Rigidhobbers—what they are—how they work—and how they can help reduce your costs.



The CLEVELAND HOBBING MACHINE Company

General Offices:
1311 CHARDON ROAD
CLEVELAND 17, OHIO

Chicago Office:
624 S. MICHIGAN AVE.
CHICAGO 5, ILLINOIS

BUILDERS OF RIGIDHOBBERS AND RIGIDTURNERS

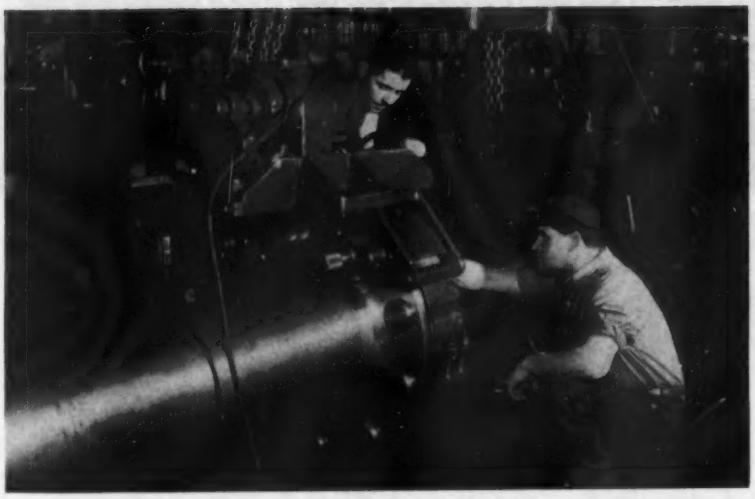
Hendy Has Portable Reamer For Line Shaft Flanges

Line reaming of tapered holes through line shaft flanges is simplified by a portable unit developed by Joshua Hendy Iron Works, Sunnyvale, Calif. The assembly has three basic parts: 1. four pedestals to line up separate shafts, if required; 2. reaming unit, a frame holding reamer and standing shaft; 3, a set of reaming bits.

The machine is mounted on the flange of the line shaft coupling and is aligned with the hole that has been rough drilled to a predetermined size by inserting a plug in the hole next to the one to be reamed. Holes can be line reamed to tolerances of 0.001 in. or less.

Excess stock is removed from rough drilled holes by means of a "porcupine" tool—a solid body with a series of 17 cutters spaced spirally around it. This roughs out stock to within 1/16 in. nominal size. The roughing reamer is then inserted and removes stock to within 0.010 in. Finally the sizing reamer completes the hole. The shaft is rotated again and indexed for the next hole.

The pedestals have leveling screws for elevating, and adjusting secews for lining up the separate shafts. The reaming unit is lowered onto the joint flanges by means of a hoist. The gear reducer drive and feed are mounted on the frame of the reaming unit. Drive power is by a 1½-hp. electric motor with a reduction unit.

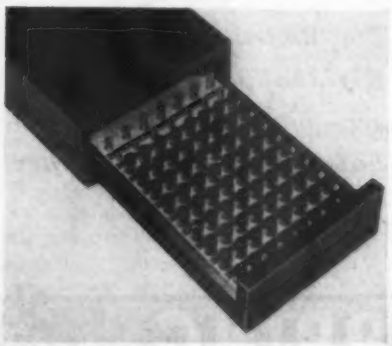


Hendy line shaft flange reamer

United Precision Cabinets Protect, Speed Pin Gages

Cabinets completely furnished with precision pin sets, number drill, and fractional sizes, are announced by United Precision Products Company, 3524 West Belmont Ave., Chicago 18, Ill.

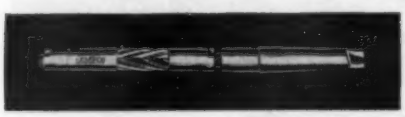
Number drill sizes 1 to 60, letter drill sizes A to Z and fractionals 1/64 in. to 1 in. in increments of 1/64 in. are of gage steel hardened to Rockwell 60-63 C. Tolerances are made to individual specifications. Cabinet 9⅞ in. wide, 15½ in. long and 4½ in. high are walnut finished and equipped with brass strips with letter, number or fractional identification permanently fixed in clear white to identify each gage position. Complete protection is afforded from moisture, corrosion and dirt.



United pin gage cabinets

Lempco Reamer Segments Held Rigid by Lock Nut

Model R hi-speed steel expansion reamer, designed and produced by Lempco Products, Inc., Bedford, Ohio, employs an adjusting lock-nut to hold the three cutting blade segments absolutely rigid, and prevents any possibility of an over-size bore resulting even when the reamer blades are subjected to excessive pressures.



Lempco Hi-Speed expansion reamer

Lempco Dual-Spiral reamer has three blade segments, two of which spiral in a direction opposite to that of the third, simultaneously. This opposite-spiralling effects a shearing action which finish-reams mirror-smooth any machineable metal, as well as laminated phenol-formaldehyde and other fibrous plastics.

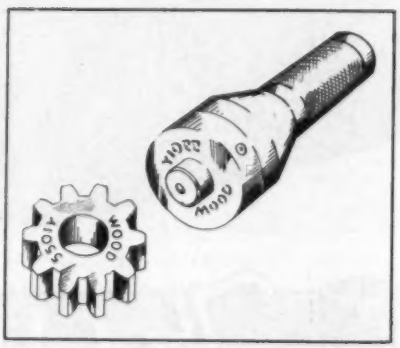
The blades may be removed for resharpening, and maintain their size and keen cutting edge longer, because from 0.035 to 0.080 in. straight line expansion is provided.

Extensions pilots, and taper bushings are available for line reaming. Nos. 1 to 5 Morse taper shanks are available, as well as butt shank type for turret lathes.

New Method Annular Stamp For Circumferential Marks

A new low-cost universal marking device for uniformly marking around the circumference of round holes, has been developed by New Method Steel Stamps, Inc., 147 Jos. Campau, Detroit 7, Mich. It offers economies for the annular marking of bushings, sleeves, gears, etc., when there are large quantities of parts to be stamped with identical series of numbers. The device consists of a pilot holder and a removable bushing or marking die retained on the holder by means of two set screws which fit into a groove machined into the pilot.

This device, although of a standard design, is manufactured to fit individual requirements, different marking dies being engraved for each need.



New Method annular stamp

A TESTING DEPARTMENT COSTS LESS THAN A GUESSING DEPARTMENT

NEW SF-010

100 Pound Universal Fatigue Testing Machine for PLASTICS PLYWOOD METALLIC MATERIALS

A constant stress fatigue testing machine for
1. Tension-Compression 2. Torsion 3. Flexure

Alternating Force Capacity 100 lb
Adjustable in units of 0.2 lb

Maximum capacity in Bending (no preload) 200 in. lb
Maximum capacity in torsion (no preload) 1125 in. lb
Speed of Alternating Force (synchronous) 1800 r.p.m.

Ample space for testing bulky assemblies, easily adjustable for various specimen sizes.

Write for Bulletin 206

BALDWIN PRODUCTS

Hydraulic presses, Testing equipment, Steel forgings and castings, Diesel-electric locomotives, Diesel engines, Metal plate-fabrication, Rolled steel rings, Bronze castings, Heavy machine work, Crane wheels, Bending rolls, Plate planers, Babbitt metal, Alloy iron castings, Briquetting presses.

The Baldwin Locomotive Works, Baldwin Southwark Division, Philadelphia, Penna. U.S.A. District offices: Philadelphia, New York, Chicago, Washington, Boston, Cleveland, St. Louis, San Francisco, Houston.

BLW THE BALDWIN GROUP

BALDWIN

SOUTHWARK

TESTING EQUIPMENT

Colonial Broach Junior Hydraulic Presses Are Designed for Flexibility and General Shop Use

A new line of general purpose "Junior" hydraulic presses, in both bench and base types, has been announced by Colonial Broach Company, Detroit, Mich. Included in the line are 1, 2 and 4 ton capacities.

Design and operating characteristics are such as to provide a high degree of flexibility for general shop use or for conversion from one form of operation to another.

Two-unit construction is used in the pedestal types. The upper unit

Colonial hydraulic press, bench mounting

is the bench type press which may be rigidly bolted to a reinforced base to form the pedestal type.

Platens are counterbored concentric with the ram, permitting ready installation and locating of fixtures in line with the ram movement on the machine. The base below the platen is slotted and relieved to permit ready use of the press for assembly work. The sides of the slot are machined in relation to the axis of the ram, to equalize clearance for fixtures on both sides. Ample day light and stroke is provided so that fairly large work (for the capacity of the machines) can be handled.

Direct-drive electric motors are vertically mounted in the column of the machine to furnish power for the hydraulic operating mechanism. Motors are designed for either 50 or 60 cycle operation. Stroke of machines may be altered by changing position of the stop collars.

For broaching, the pedestal type models are available with a large coolant reservoir, fitted with chip strainers. Chips are readily removed through the door in the front of the base. A centrifugal type coolant pump in such cases is externally mounted on the rear of the base, where it is direct-driven by individual motor.

Normal ram speed of the machine is 30 ft. per min. (15 ft. per min. on the 4-ton type). Speed is readily adjustable to any value below this with an accessory control available with the machine.

"Precisionplate" Thread Plugs In Standard and Special Sizes

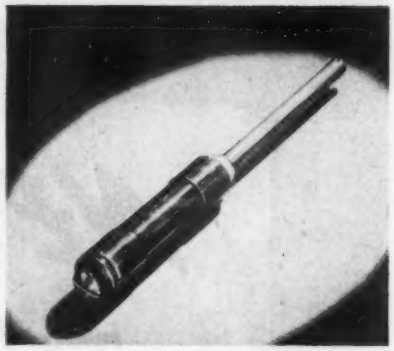
A method of uniformly and adhesively bonding chrome to the full thread form on a thread gage, with the trade name of "Precisionplate," has been developed by the Sheffield Corp., Dayton, Ohio. This process enables the adhesion, toughness and thickness of the chromium to be controlled to a fine degree of precision.

The chromium is bonded to the steel with such adhesion that "Precisionplate" plugs are extraordinarily chip-resistant. The relative uniformity from the crest to the root makes it possible for the gage to give a more accurate check during its life, which laboratory checks and field tests show is four to six times that of conventional steel.

Among the advantages claimed for "Precisionplate" is increased resistance to corrosion caused by handling or the atmosphere, as well as scoring, marring, and other damage due to rough handling. "Precisionplate" thread plugs are stocked in standard sizes and have an accuracy of Class X tolerance in lead, angle and pitch diameter. Special "Precisionplate" plugs can be made to order.

Nobur Makes Foot Control For Use on Drill Presses

A foot control unit, manufactured by Nobur Manufacturing Company, 910 N. Orange St., Los Angeles, Calif., is designed for use on any drill press in order to convert it to deburring operations. It provides an easier method for actuating the movement of burring blades, and leaves the operator's hands free for handling parts.



Rieger spindle stop

Rieger Spindle Stop with Expanding Collet Action

Rieger Manufacturing Co., Dept. AM-7, Miamisburg, Ohio, has ready a new spindle stop with expanding collet action. While the front end of the device is held in place with one screwdriver, a turn on another at the rear end makes the stop expand to tighten itself in the hole of the headstock spindle. This is said to avoid any scarring or burring of the walls.

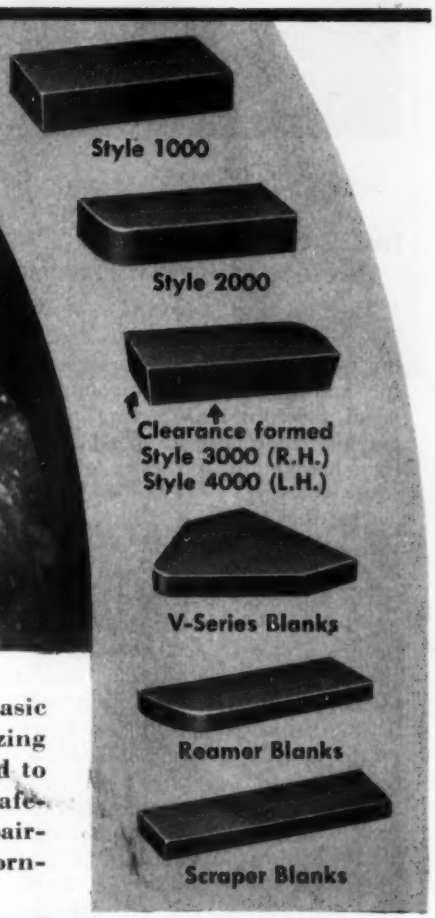
The Rieger Spindle stop is equipped with a 5/16 in. × 4 in. extension for limiting hollow work and for protrusion into the chuck for stopping short pieces. The extension is soft so that it can be turned down to a smaller diameter if desired. It can be removed for positioning solid pieces. The body of the device is 3 in. long and slightly under ¾ in. dia. when contracted.

Used for repeat operations on the lathe, the spindle stop limits the entrance of work into the spindle hole. It can be utilized without a chuck. The regular model is applicable to lathes with ¾ in. holes.

No Burr foot control

STANDARD *Carboloy Blanks*

FOR RAPID BRAZING TO YOUR TOOLS & CUTTERS



For convenience, economy, flexibility, many plants maintain a basic stock of standard Carboloy Blanks in their tool cribs for rapid brazing to tool and cutter shanks. In this way your plant can be prepared to rapidly tool-up special jobs on a moment's notice. A worthwhile safeguard to provide for emergency tooling. Handy, too, for quickly repairing cutters damaged through accidental abuse, and for salvaging worn-out high speed steel cutters.

Prompt deliveries from stock. Styles as shown, in wide range of sizes. For cutting steel, cast-iron, non-ferrous and non-metallics. Brazing instruction manual free on request. Training film strip also available, at print cost of $3.50.

Be prepared for all requirements. Keep a stock of standard Carboloy Blanks on hand. Write for catalog GT-175.

In Stock

Prompt deliveries. Styles as shown. Wide range of sizes.

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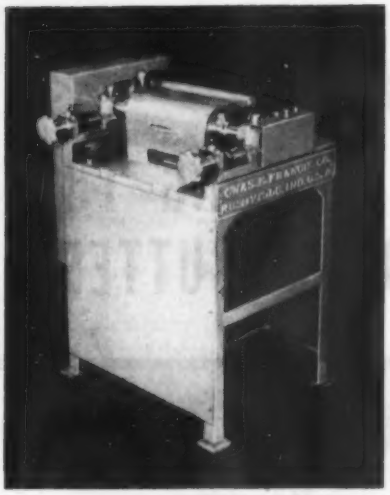
TUNGSTEN CARBIDES ★★★ TUNGSTEN CARBIDES WITH TANTALUM AND/OR TITANIUM CARBIDES



Francis spreader

Francis Spreader Suited to Drawing Compound Spreading

The Model SER spreader, manufactured by Charles E. Francis Co., Rushville, Indiana, is said to be suited for putting drawing compound on metal sheets or for putting photographic emulsions on metal sheets for photographic processes of template work.

The spreader is regularly furnished with a steel coating roll of 5½ in. dia. and corrugated or knurled. In cases where some adhesives attack metal rolls, a rubber covered roll is furnished at extra charge. The doctor roll is 3⅞ in. in dia. and is driven. It is regularly of plain steel, but can be chrome plated, if necessary to resist harmful adhesive action.

The machine is regularly motorized with ¼ hp., 110 v., or single phase motor with necessary gearing to give a roll speed of 38 r.p.m. This amounts to 55 lin. ft. per min. Speed can be changed to order.

Starrett "Safe-Flex" High Speed Steel Hacksaw Blades

The new "Safe-Flex" hacksaw blade designed by the L. S. Starrett Company, Athol, Mass., is made of high speed steel so treated as to combine a soft, flexible back with a hard cutting edge. The result, says the manufacturer, is a blade that is practically unbreakable under hard use or abuse, that cuts the hardest materials quickly and stands up over a long period of service.

Starrett "Safe-Flex" hacksaws are furnished in 10 and 12 in. lengths, the 14 and 18 tooth-per-inch blades with "alternate set" and the 24 and 32 tooth-per-inch blades "wavy set."

G-E Provides Tempering Unit For Synchronous Spot Welding

A new tempering attachment, for use with G-E synchronous spot-welding controls which incorporate the phase-shift method of heat control, has been announced by the Industrial Control Division of General Electric Company, Schenectady, N. Y. The new auxiliary control is suitable for use in the spot-welding of air-hardenable steels, since it permits tempering the weld while the work is still in the machine, thus reducing hardness and increasing ductility.

The attachment consists of a heat-control and time-control adjuster for tempering, and the relays which automatically transfer the additional heat-and-time adjustment from the spot-welding control with which the attachment is being used.

The new attachment is enclosed in a metal case designed for wall mounting. The calibrated adjustment dials

G-E tempering attachment

are mounted on the hinged door of this case, together with an on-off switch for preventing the relays being energized when ordinary spot or pulsation welding is being done.

Gilbert-Baker-Midlam Adds New Step Chuck to Line

The Gilbert-Baker-Midlam Co., 38 North Jefferson St., Dayton 2, Ohio, has added a 4½ in. step chuck to its line. According to the manufacturer's description, this extra-capacity step chuck provides chucking facility on any lathe, mill or grinding machine equipped with draw-in collets, with collet accuracy and collet speed. The hardened shank and tapered shoulder extends through the closing sleeve, is attached to the machine spindle by a drive fit and threads into the draw-bar. The unhardened chuck head can be bored to fit work ⅝ in. to 4 in. dia.

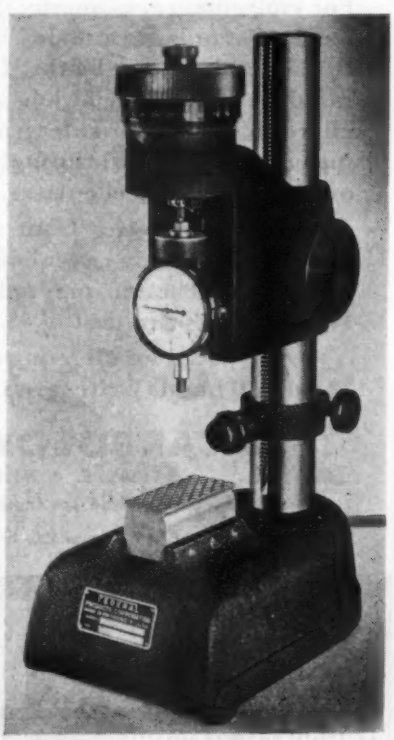
Federal Products Comparator Equipped With Micrometer Head

Model 120B-1 combination micrometer and dial indicator comparator has been announced by Federal Products Corporation, 1144 Eddy St., Providence 1, R. I. The comparator provides its own device for setting it at the specified dimension. The micrometer head takes the place of gage blocks and master gages for setting the comparator. It is suited for precision inspection of screw threads for accuracy of pitch diameters. An auxiliary weight is provided to give the required tension for all threads over twenty pitch.

It is equipped with a Federal super-sensitive low friction dial indicator graduated in 0.0001 in. and having high repetitive accuracy.

The large diameter of the micrometer thimble permits graduations of 0.0001 in. indirectly on the thimble. Its range is 0.008 in. Maximum vertical capacity is 8 in., and maximum throat depth is 3⅞ in.

The micro-comparator is also used for direct measuring and with a constant pressure by setting the dial indicator at zero and using that position as a reference.



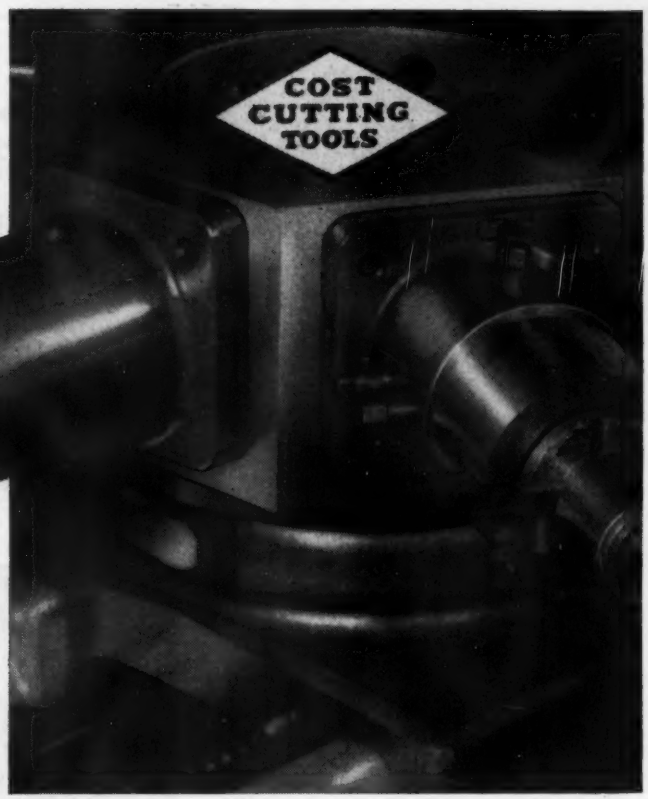
Federal micro-comparator

McCROSKY SUPER

Inserted-Blade

Adjustable

REAMERS



Standard McCrosky Super Adjustable Reamers delivered from stock have started thousands of war production jobs with a minimum of delay. These time-saving applications are possible because Super Reamers are available in many different styles, with a wide range of sizes in each style.

This fundamental advantage is increased by the ease and economy with which Super Reamers can be maintained at top efficiency. The time-tested Super Pin-and-Screw Lock permits quick adjustment and resharpening of reamer blades with a minimum of down-time. When the original set of blades has been worn out, the reamer can be completely renewed by inserting a new set of blades in the original body. Each size of blade services many different sizes of reamers.

You can depend on quick deliveries of Super Reamers and extra blades from adequate stocks protected by continuous production.

To help you select the right Super Reamer for your application, ask for McCrosky Bulletin 16-A. To help your operators get maximum performance on the job, ask for the McCrosky Reamer Manual.

WHICH STYLE FITS YOUR APPLICATION?

• SUPER Chucking Reamer
Straight, or Morse Taper Shank
• SUPER Shell Reamer with Taper Hole for standard arbor
• SUPER Shell Reamer with large Straight Hole for mounting on line-reaming bar

The COMPLETE McCROSKY LINE

SUPER Adjustable Reamers
Adjustable Block Boring Bars
JACKLOCK Milling Cutters
Special-Purpose Cutting Tools
WIZARD Quick-Change Chucks
Turret Tool Posts.

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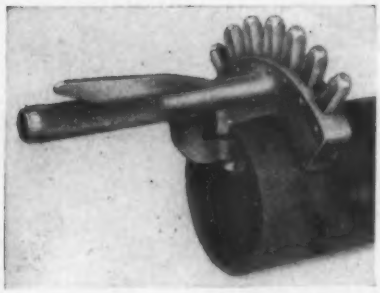
McCROSKY TOOL CORPORATION
MEADVILLE, PA.

COST CUTTING TOOLS



Cunningham peripheral marking holder

Cunningham Character Holder Enables Peripheral Marking

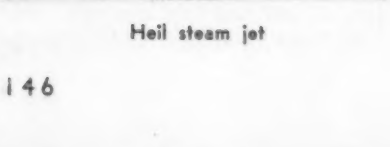
A new safety peripheral marking holder for stamping around the outer circumference of tubing has been developed by the M. E. Cunningham Company, 95 E. Carson St., Pittsburgh, Pa.

The peripheral holder is of all-welded design, features a hand grip lock and is equipped with a pointed screw which holds the unit firmly in position for marking.

The holder eliminates separate handling for each character and permits marking around the end rather than marking along the length of tubes. It is available with any reasonable number of characters.

Heil Steam Jet for Round, Square or Rectangular Tanks

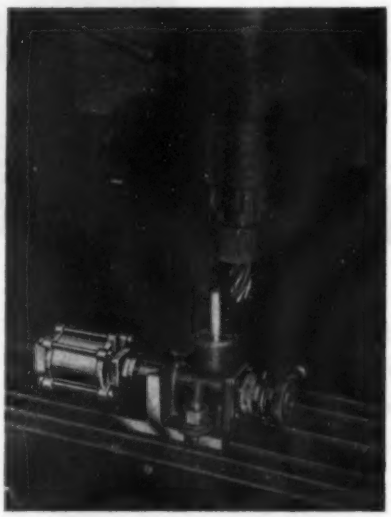
A steam jet for tank processing of bar metals, wire, and continuous sheet or strip has been developed by the Heil Engineering Co., 12901 Elmwood Ave., Cleveland, Ohio. This jet is furnished in flanged sections which can be coupled together to provide any desired length, and to extend the agitating and heating effect to any part of the tank. Designed to speed pickling or processing and to provide more complete agitation and more uniform heating, this jet can be adapted to square, round or rectangular tanks in which boiling temperatures can be attained. The sections are usually made in lengths of about 10 ft., and are coupled with lead bolts, with a blind flange to close the open end.



Heil steam jet

The series of nozzles along the entire length of the tank cause a rolling effect that allows the liquid to circulate above and around the parts immersed. The nozzle, with an orifice of graphitic carbon which the makers claim is not affected by the corrosive attack of most chemical solutions, can be set at angles on the sides and bottom of the tank to provide a maximum rolling effect.

The jets are furnished with a steam flange and bolts to connect to a standard 6 in. O.D. flange reduced for 1 in. steam supply line. Recommended steam pressure is 80 lb., a maximum of 125 lb. may be used.



Wayne collet chucking fixture

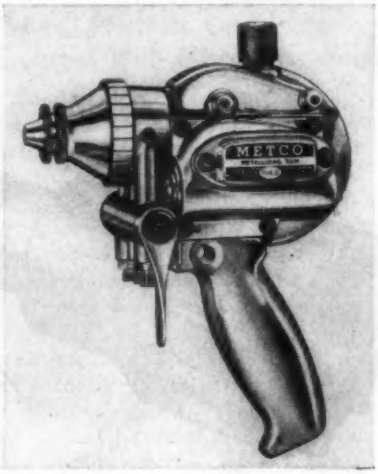
Wayne Collet Chucking Fixture Is Operable by Air or by Hand

The Wayne Pump Company, Fort Wayne 4, Ind., has redesigned its collet chucking fixture for air or hand operation interchangeably, using the same four-piece blank collet which was a feature of the previous model.

The user drills collets to desired size up to 1/16 in. on work that passes through collet, or to 1 in. if depth of drill is not more than 3/4 in. The collet fits into a pull-down holder operating either by hand lever or air motor. Collet parts are held together by snap ring and contain internal opening springs which function when closing pull is released.

Air motor, which may be applied with a few simple adjustments, is available with a valve synchronized to the operation of the machine so that both hands are kept free for the work. This eliminates the need for special fixtures or collets.

Jaws are of tool steel and may be hardened after drilling if desired. Dimensions include: Base 4½ × 6 in., 4⅛ in. high, 8½ in. overall length.



METCO speedy metallizing gun

Metallizing Engineering Co. Speedy Metal Spray Gun Ready

Metallizing Engineering Company, 38-14 30th St., Long Island City 1, N. Y., has developed the METCO type 3E metallizing gun, especially engineered for the high speed production spraying of low melting point metals. Rates of deposition, in pounds per hour, include: zinc, 40; tin, 70; lead, 110; solder, 90, and babbit, 75.

Regardless of the type of wire employed, no gear changes are necessary to achieve these extraordinary high speeds. Any spraying speed within the prescribed ranges is automatically obtained, and maintained hour after hour by a controlled power unit built into the gun. Air pressure fluctuations do not affect its operating efficiency.

In common with all METCO metallizing guns, the type 3E is equipped with a Universal Gas Head, which allows the tools to be operated on any commercial gas, in conjunction with oxygen and compressed air.

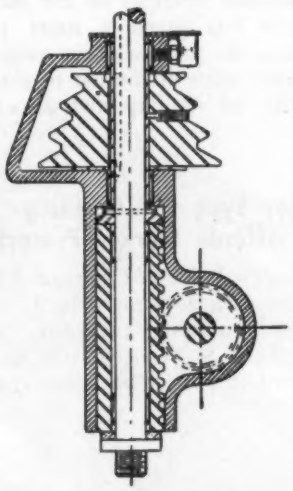
Owners of METCO type E or 2E guns may have their present equipment quickly converted to a type 3E. Or, the type 3E may be converted back to the standard type.

Correction

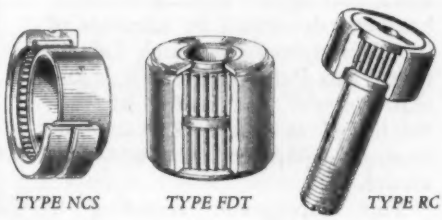
Maximum rating of Automatic Machine and Tool Company's Multiflex coupling, described in June 22 issue of AMERICAN MACHINIST, is 60.0 horsepower.

Needle Bearings Aid Design Simplification

TYPE DC *DC (Inner Race)* *TYPE AT*



This X-section of a drill press spindle illustrates simplicity of design possible due to compact size, high capacity and ease of lubrication of Needle Bearings.



TYPE NCS *TYPE FDT* *TYPE RC*

FEATURES OF THESE MODERN ANTI-FRICTION UNITS ALL CONTRIBUTE TO INCREASED OPERATING EFFICIENCY

In almost any application where Torrington Needle Bearings are employed, the design problem is simplified—due to the unusual combination of advantages which these modern anti-friction bearings offer.

The advantage of higher capacity in smaller space, for example, means that smaller, simpler housings may be employed. This in turn means less material is required in the housings, with a consequent reduction in weight and lighter, more compact design of other members is often made possible.

The efficient lubrication of Torrington Needle Bearings is another feature which aids the designer. The retaining raceway which holds the full complement of needle rollers also provides a natural reservoir for retention of the lubricant. Thus, in most designs, need for auxiliary seals and special lubricating systems is eliminated. In fact, in certain applications, Needle Bearings lubricated on installation, will operate entirely satisfactorily without further service attention during the life of the product!

Assembly Also Simplified

Production and assembly problems are also simplified, thanks to the ease of handling and installation of Torrington Needle Bearings. The designer need only provide the simplest type of bearing mount—a bore machined to proper dimensions. Also, as Needle Bearings will not creep or slip, spacers or other locking devices are not necessary to hold them in place under either rotating or oscillating operation.

All of these features contribute to simplification of design—with resulting increases in operating efficiency, longer service life and manufacturing economies that are helping now in meeting wartime production. And they will be of equal value in meeting the demands for the peacetime products of tomorrow. Investigate for yourself the ways in which Torrington Needle Bearings will aid your postwar plans. The Torrington Needle Bearing Catalog 30-A gives more complete information. In addition, the services and experience of our engineering department are available to assist you in securing full advantages of the application of Needle Bearings in *your* products.

THE TORRINGTON COMPANY

Established 1866 • Torrington, Conn. • South Bend 21, Ind.

"Makers of Needle Bearings and Needle Bearing Rollers"

New York Boston Philadelphia
Detroit Cleveland Seattle
San Francisco Chicago Los Angeles
Toronto London, England

TORRINGTON

NEEDLE BEARINGS

Parts and Materials

Westinghouse Reveals the Development of War-Born Plastics of Superior Qualities and High Strength

Fosterite, a tough new moisture-proof plastic which seals radar and radio parts against harmful moisture, has been developed by scientists of the Westinghouse Research Laboratories, East Pittsburgh, Pa. It is said that Fosterite will greatly lengthen the life of radio and other communications equipment used by Allied armies.

This impregnant, according to Westinghouse, is almost as fluid as water and fills completely every tiny space in electrical windings and coils. A special-coating form of the material can be applied to the apparatus, leaving no airgaps through which moisture could seep. It is explained that this happens because Fosterite, unlike varnish, requires no liquid solvent which would evaporate during the heating process and cause tiny cracks to appear.

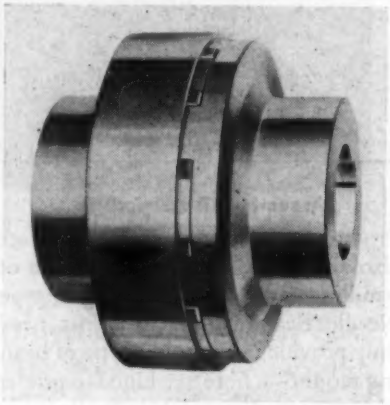
The development of "preformed plastic" with tensile strength of structural steel, has also been announced by Westinghouse. This new plastic is said to have both strength and formability to a degree never before achieved in a single plastic material. It weighs only a third to a half as much as the aluminum alloys used in airplane construction, yet it is so strong that a one-inch bar can stand a pull of 16,000 lbs.

Development of Micarta 444, a plastic which, after quick heating, may be stretched into complicated shapes previously impossible with laminated plastics, has also been announced. It is, according to Westinghouse engineers, as tough and reliable after it has been shaped as before. A one-inch square bar of the material will stand a tensile "pull" of 13,000 lbs. and carry a compression load of 30,000 lbs. without cracking. At temperatures as high as 170 F. it will not wilt and even gains in impact strength.

The development of a synthetic resin to replace shellac in many important applications, has also been revealed by Westinghouse. Necessitated by wartime elimination of Oriental supplies, breakdown, and analysis and synthesis of the shellac molecule has given a more pure product. It promises not only to eliminate much of the use of shellac but also of its imported associate, mica.

Lovejoy Type "C" Coupling Affords Worker Protection

The new L-R type C shrouded flexible coupling announced by Lovejoy Flexible Coupling Company, 5009 West Lake St., Chicago 44, Ill., is designed to protect operators against

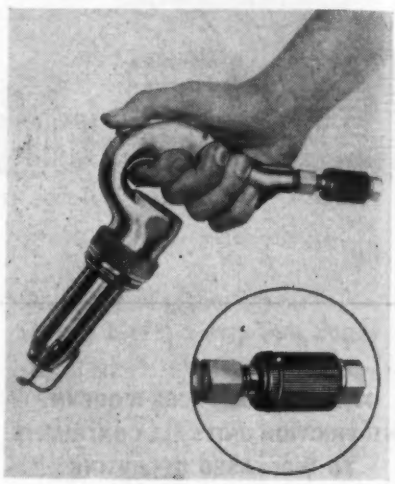


Lovejoy shrouded coupling

the catching of clothing. An extension of the collar which holds the load cushions encircles the coupling, safeguarding material and fingers from the heads of the bolts. While the boltheads are concealed, they are easily and conveniently reached when necessity arises.

This coupling is designed for heavy duty service from 4.60 to 806 hp. at 100 r.p.m. Individual free-floating load cushions between the jaws are held in position between an inside steel sleeve and the removable steel collar.

Types are available for directly attaching to flywheel, as well as drum types and others for rapid disassembly without disturbing drive or driven equipment. Cushions of various materials adapted to the particular service on which the coupling is used are free to deform to every emergency. Smooth maximum power flow is assured.



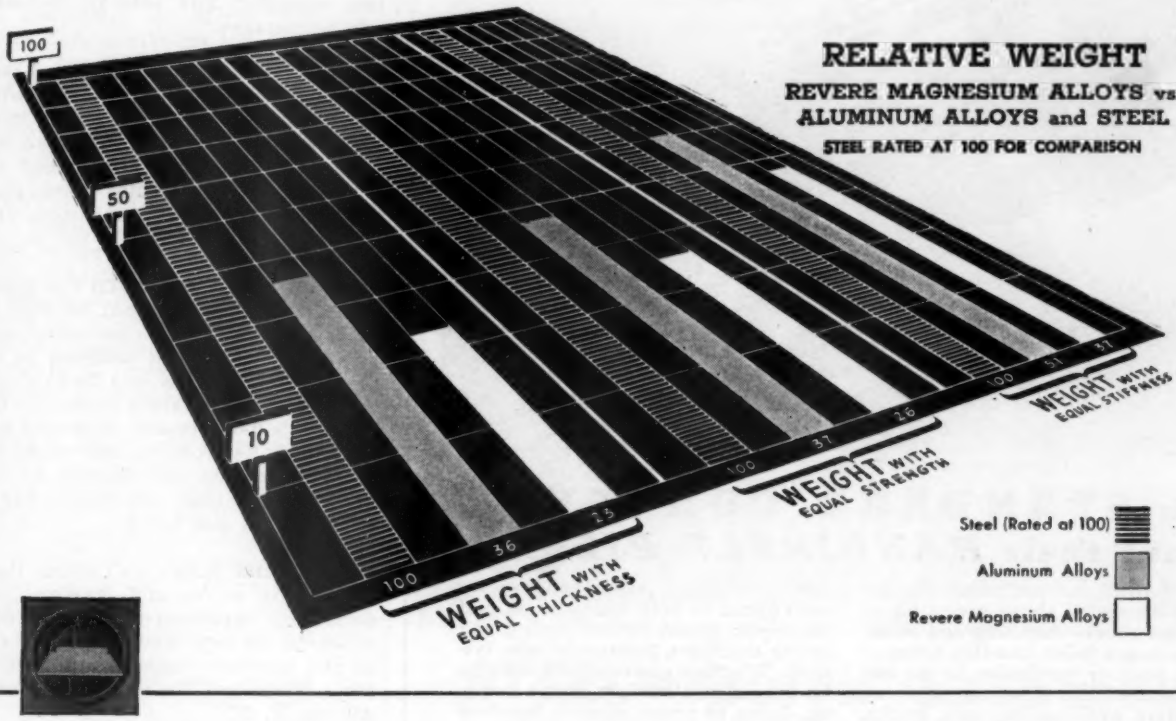
Burklyn adjustable flow regulator

Burklyn Regulator For Use As Control or Shut-Off Valve

The adjustable flow regulator for regulating the volume of air or fluid flowing from the supply line of pneumatic tools or other devices or for use as a shut-off valve is offered by the Burklyn Company, Los Angeles, Calif. Simple rotation of the outside knurled sleeve provides the flow control or regulation which is started by a clockwise rotation and closed by the counterclockwise movement.

Eight adjustment points are provided for one revolution of the sleeve and each opening increases or decreases the opening 0.004 in. The regulator may be attached to a supply line carrying air, water, gas or oil and will hold up to 1500 lbs. pressure without leaking. When the regulator is used as a control valve, it is claimed that there is no leakage from line to atmosphere because of the positive seal from the high pressure side of the regulator to the atmosphere. In cases where the tool iiself has an internal shut-off valve, no leakage is apparent when the regulator is left wide open.

NOW AVAILABLE } Magnesium Alloy Sheets by REVERE



THE world's largest magnesium sheet and plate mill is now in operation—by Revere. Here are produced the three alloys in demand for wartime uses:

Revere Magnesium "M" — Magnesium-Manganese alloy with moderate strength and good forming characteristics.

Revere Magnesium "FS-1"—magnesium-aluminum-zinc alloy, a general purpose metal combining high strength with good forming characteristics.

Revere Magnesium "J-1" — magnesium-aluminum zinc alloy, the highest strength sheet available.

When production exceeds war needs, Revere Magnesium Alloys will be available for use in an ever-increasing number of fields, such as automotive, household appliances, railroads. These alloys will bring revolutionary economies in weight, power, machining, production, labor. For technical assistance in planning conversion to these wondrously light magnesium-base metals, write Revere.

REVERE MAGNESIUM ALLOY SPECIFICATIONS

Grades and Tempers
h = hard rolled a = annealed
r = hot rolled

Alloys M, FS-1, and J-1 can be furnished in these tempers:

Revere M	Tempers h, a, r.
Revere FS-1	Tempers h, a, r.
Revere J-1	Tempers h, a, r.

The mill should be consulted regarding these tempers.

LIMITS OF MANUFACTURE

Sheets and Plates

Supplied from 0.020 inch and thicker in a wide range of sizes, depending upon the thickness and weight of the sheet or plate.

INDEX TO SPECIFICATIONS

Form	Revere Alloy	American Society for Testing Materials Alloy Designation	American Society for Testing Materials Specification No.	Society of Automotive Engineers	Aeronautical Material Specifications S. A. E.	Navy Bureau of Aeronautics Alloy Designation	Navy Bureau of Aeronautics Specification No.	Navy Department Alloy Designation	Navy Department Specification No.	U. S. Army Air Forces Alloy Designation	U. S. Army Air Forces Specification No.
Plate, Sheet and Strip	M	11	B90-41T	51	4370	..	..	11	47 M 2	1	11339
	FS-1	18X	B90-41T	..	....	..	..	18	47 M 2	..	11340
	J-1	8X	B90-41T	..	4380**	..	..	8	47 M 2	2	11338

**4380 annealed 4381 hard rolled

REVERE
COPPER AND BRASS INCORPORATED
MAGNESIUM-ALUMINUM DIVISION
Founded by Paul Revere in 1801
Executive Offices: 230 Park Ave., N. Y. 17, N. Y.

Photo: Courtesy Air Cargo Development Section — Pennsylvania-Central Airlines

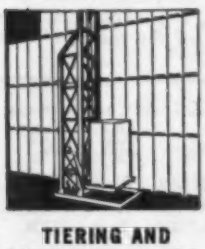
Ask STANDARD CONVEYOR about their *HANDIBELT PILERS!*

PORTABLE, inclined pilers like the one illustrated above save a lot of time and effort—handling and stacking packages, bales, bundles, boxes—in the plant or warehouse, at the airport, around the shipping platform, unloading and loading cars, trucks, boats, transport planes.

Handibelt Pilers are available in a wide variety of sizes and styles as required by various commodities. The unit illustrated has an adjustable boom which is easily extended over piles or into car or truck; the boom is clear of all supporting obstructions and is adjustable up to 7½, 8½ and 9½ feet. It handles individual items up to 100 lbs. Other Standard Pilers elevate and stack up to 30 feet. Individual horizontal conveyor sections can also be furnished; these are particularly useful for shipside loading and unloading.

Standard Conveyor makes an unusually wide variety of handling equipment including power and gravity conveyors in belt, roller, chain and slat types; spiral chutes, tiering and lifting machines, pneumatic tube systems. Whether commodities have to be moved in a straight line, a curve, up, down, or across, there is Standard equipment to handle the job, developed in more than forty years of conveyor engineering and manufacture. Write for complete information on Portable Pilers and valuable catalog AM-74 "Conveyors by Standard."

STANDARD CONVEYOR COMPANY
General Offices: North St. Paul, Minn.
Sales and Service in Principal Cities


TIERING AND LIFTING MACHINES

PORTABLE PILERS

SPIRAL CHUTES

PNEUMATIC TUBE SYSTEMS

TRADE PUBLICATIONS

CUTTING ALLOY Crucible Steel Co. has published a 28-page catalog on its Rexalloy non-ferrous cutting alloy. This illustrated book includes complete information about Rexalloy, its range of speeds and feeds, and gives data on Rexalloy tipped tools, standard ground tool bits, castings, and other pertinent facts.

DRILL PRESS FEED A three-page circular on its Copilot drill press feed regulator has been distributed by Special Devices Co., Berlin, Conn. The circular shows an installation photo of this regulator, and lists its features and advantages.

DRILLS High speed spotting and centering drills which are made with shorter flutes and overall length than regular drills are illustrated and described in a circular announced by Whitman & Barnes, 2108 West Fort St., Detroit 16, Mich. Dimensions and list prices are included.

ELECTRONIC PRODUCTS The North American Philips Co., Inc., 100 East 42 St., New York 17, N. Y., has announced publication of a book designed to introduce the company and its products to industry. It covers a history of the company's development, its plants and affiliations, its products, and briefly describes what its contribution to the war effort has been and what it has in mind for the postwar era.

FASTENERS A 16-page catalog, illustrated with photos and drawings and describing improvements in and uses to which the new Simlok fastener can be put, has been issued by the Simlok Div., Simmons Machine Tool Corp., Albany, N. Y.

FORGING "Strike While the Iron is Hot" is the theme of a 20 × 30-in. poster prepared for forge shops by Chambersburg Engineering Co., Chambersburg, Pa. It pictorially contrasts hot flash vs. cold flash and points out the advantage of the former as compared to the latter.

GAGE BLOCK "The Saga of Ellstrom" is the title of a booklet published recently by the Dearborn Gage Co., 20038 Beech St., Dearborn, Mich. It tells the complete story of the creation and development of the Ellstrom gage block.

GAGES Arthur A. Crafts Co., Inc., Kenmore Square, Boston, Mass., has announced a 64-page catalog on carbide-tipped gages and diamond-mounted tools. Conveniently indexed, this book contains illustrated sections on standard and special gages, special tools and standard and special diamond tools, wear parts and diamond dust. Price and reference lists are included.

GAGES Engineering data and description of the complete line of Metro precision gages and carbide tipped tools is contained in a 36-page, illustrated catalog, No. 102, offered by Metro Tool & Gage Co., 4240 Peterson Ave., Chicago 30, Ill.

IDLERS A 16-page illustrated Book No. 1915, published by Link-Belt Co., 307 North Michigan Ave., Chicago, Ill., describes the "100" Link-Belt anti-friction idler for belt conveyors, and gives detailed information on sizes available in several types. The book also includes a history and photos of conveyor idlers dating back to 1896.

INSULATING TESTER The Herman H. Sticht Co., Inc., 27 Park Place, New York 7, N. Y., has issued a bulletin, No. 435, describing the Model B-5 megohmer, battery-vibrator type insulation tester. The bulletin shows the triple color scale, the various models available, and discusses the value of periodic insulation resistance measurements as recorded on this instrument.

LATHES A condensed catalog covering a complete line of lathes has been issued by the South Bend Lathe Works, South Bend 22, Ind. This eight-page, file size book contains photos and descriptions of engine lathes, toolroom lathes and precision turret lathes for practically all types of production, toolroom and maintenance work.

LATHES Those concerned with the problem of increasing production on turning operations will find valuable information in a booklet, "How to Increase Production on Short-Run Turning with an Automatic Lathe," offered by the Sundstrand Machine Tool Co., Rockford, Ill. The bulletin is illustrated with photos and tooling sketches and covers short-run jobs in detail, offers solutions for special lathe or high production jobs, and includes practical tips on processing work and set-ups. Requests must be made on company letterhead.

LUBRICATION The elimination of hazards due to manual lubrication of high-up and hard-to-get-at bearings on presses, cranes and other off-the-floor types of equipment is the subject of an illustrated bulletin issued by The Farval Corp., Cleveland, Ohio. It explains the Farval Dualine system and illustrates various types of systems with their typical applications.

MALLETS Greene, Tweed & Co., Bronx Blvd. at 238 St., New York 66, N. Y., is distributing a bulletin entitled "A Blow without a Dent" which features **BASA** replaceable face hammers and **EMPIRE** soft face mallets. The bulletin illustrates the plastic faces and heads which are available for these items, as well as heads and faces of other materials.

MANAGEMENT The George S. May Business Foundation, 2600 North Shore

Advertisement

What About Your Steel Inventory?

No large-scale production curtailment is expected until after the surrender of Germany. However, ordnance schedules are being adjusted constantly. This has resulted in cut-backs from some metal-working plants . . . some of which have been confronted already with the task of disposing of steel overstocks. Since a great deal of this steel is not easily converted to other applications, these inventories frequently become liabilities.

We urge you to try to avoid this loss by keeping your inventories at a practical working level, without excessive reserves. We believe this is entirely safe today, because warehouse stocks are in relatively good shape. Thus in buying steel from stock, as you need it, you don't incur undue risk to continuous production. Nearby warehouse stocks can help you meet all emergencies.

STEEL—Quick Shipment

JOSEPH T. RYERSON & SON, INC.

CHICAGO	Rockwell 2121
MILWAUKEE	Mitchell 7000
DETROIT	Madison 3860
ST. LOUIS	Central 1020
CINCINNATI	Cherry 3232
CLEVELAND	Henderson 1000
PITTSBURGH	Walnut 7540
	Carnegie 795
PHILADELPHIA	
	Bell-Belgrade 1412
	Keystone-West 1644
BUFFALO	Humboldt 3311
NEW YORK	Rector 2-3700
Newark	Market 2-6067
Jersey City	Bergen 4-1123
BOSTON	Kirkland 6000

Call the Plant Nearest You

From 11 Convenient Ryerson Plants

Your nearby Ryerson plant carries large stocks of practically every kind of steel you need. All the various shapes and sizes — hot rolled, cold finished and heat treated — in carbon, alloy, stainless and tool steel grades, are ready for immediate shipment. Special steels — free-machining, forging, heat treating or for other processing — are also included.

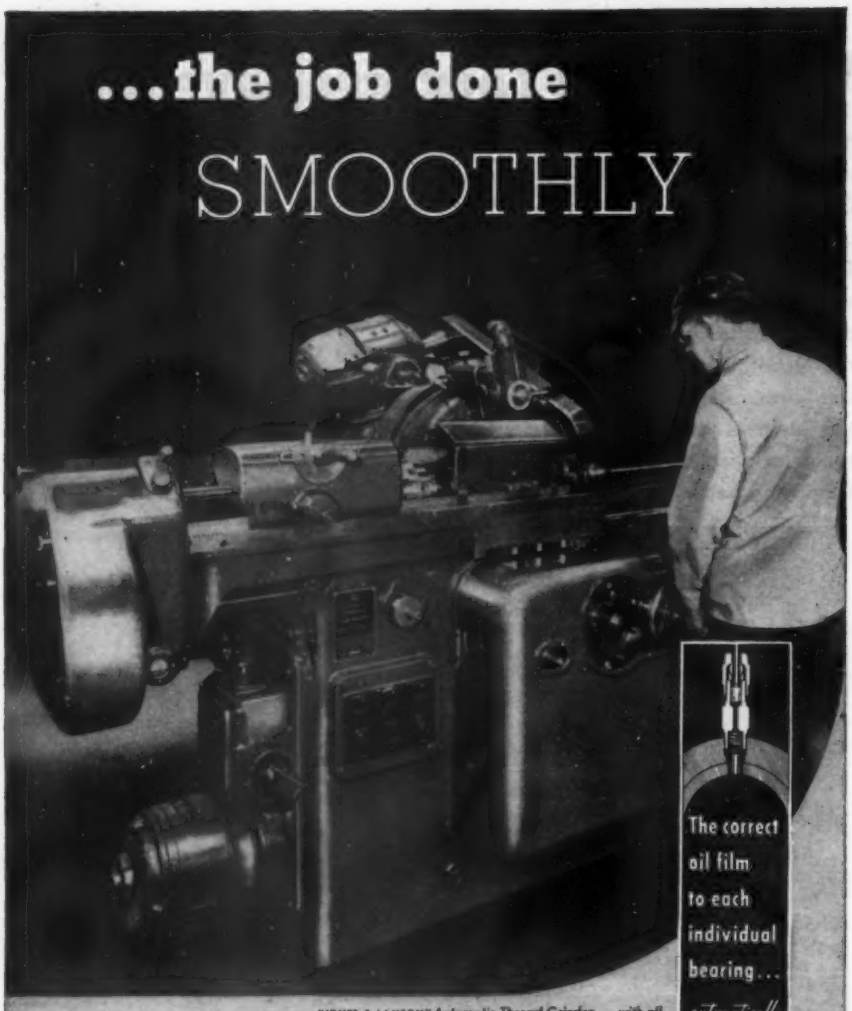
All Ryerson alloy steels are identified with heat symbols stamped or tagged on the bars. Complete test data on analysis, hardenability response and obtainable physical properties for 1, 2, 3 and 4 inch rounds quenched and drawn at 1000°, 1100° and 1200° F., is furnished with each alloy shipment.

Put these convenient stocks to work for you. Call Ryerson next time you need steel. Prompt, personal service is assured.

RYERSON STEEL-SERVICE

...the job done

SMOOTHLY



"JONES & LAMSON" Automatic Thread Grinder . . . with all bearings except grinding wheel spindle Bijur-lubricated.

● No time is lost from productive work . . . a BIJUR-equipped machine oils itself, while running! Metered oil-feed—the correct oil-film needed by each individual bearing—is supplied automatically. The efficiency of operator and machine is raised . . . precision standards are held . . . maintenance is reduced to a minimum . . . production stepped up!

BIJUR LUBRICATING CORPORATION, LONG ISLAND CITY, N. Y.

1385

BIJUR

AUTOMATICALLY Correct LUBRICATION

Ave., Chicago, Ill., has released two reports of present and postwar interest to manufacturers. "Picking Products that Pay" (Report 153) attempts to set forth facts the manufacturer will need to distinguish between profitable and unprofitable products to make and market. "Common Blunders of Modern Business" (Report 154) is an analysis of the operations of 117 American companies, pointing out mistakes in management and their results.

MANAGEMENT Foremen, department heads and supervisors will find information of value in a booklet, "How to Cut Waste," available from Elliott Service Co., 219 East 44 St., New York 17, N. Y. The booklet outlines a four-step plan to reduce waste and explains how the plan can be put to work to save manpower, materials and supplies, machinery and equipment, and time.

MANAGEMENT Policyholders Service Bureau, Metropolitan Life Insurance Co., 1 Madison Ave., New York 10, N. Y., has published a study entitled "Orienting the New Worker." Described in the study are various plans and techniques designed to promote friendly relations with new employees and suggestions are offered for use in the orientation of individuals and groups of employees. Business stationery must be used in making requests.

MANAGEMENT Sav-Way Industries, Detroit, Mich., is offering a pocket-size booklet entitled "The Middle of the Shop." It discusses the importance of and the advantages to be gained through harmonious employee-management relations, and offers some suggestions for the promotion of understanding and cooperation between production men and the workers in their shops.

MARKING Jas. H. Matthews & Co., 3942 Forbes St., Pittsburgh 13, Pa., has announced Bulletin A-2 on "Lo-Stress" stamping. The folder illustrates and describes the line of steel hand stamps, stamping dies for power and foot presses, and various accessories for use in cases where parts marked are placed under torsion, tension, bending or other stresses, or where heat treating is accompanied by cracking or breaking.

MEASUREMENTS Bartelt Engineering Co., 1214 Partridge Ave., Beloit, Wis., has completed a circular illustrating a line of pedestal micrometers and indicators. The circular shows photos of the various items and gives the features, uses and prices of each.

MEASUREMENTS Metrical Laboratories, Inc., 402 Detroit St., Ann Arbor, Mich., has released a bulletin featuring its new precision external indicating gauges, using the flow of air as the measuring medium and operating in conjunction with the Metricator instrument. The features, operation, maintenance and advantages of these gages are discussed in detail.

MODEL MAKING Step-by-step pictorial description of how gypsum cements are being used to speed up production of patterns and models for the aircraft and metal industries has been published by the United States Gypsum Co., Chicago, Ill., in a manual entitled "How to Make Patterns and Models with Gypsum Cement."

OILERS Bulletin 27-A, available from Trico Fuse Mfg. Co., Milwaukee, Wis., describes a modernized line of wick feed oilers, supplying visible and automatic lubrication, and offers helpful hints on the prevention of needless shutdowns for hand oiling, splattering of oil, bearing failures and other similar lubrication problems.

PANELBOARDS A 16-page pamphlet, describing a method of converting obsolete and inadequate electric lights and power panelboards to full efficiency without disturbing the box or conduit, may be secured from the Square D Company, 6060 Rivard St., Detroit 11, Mich. This booklet (CA-575) gives a brief history of each conversion and shows before-and-after photos.

PLUG GAGES In a bulletin containing complete information on features, uses, operation, sizes, ranges and prices, the George Scherr Co., Inc., 200 Lafayette St., New York 12, N. Y., features its new Atlantic Emergency Set containing 36 cylindrical plug gage blanks in steps of 1/16 in. with handles. This set will permit any shop to produce any size plug gage from 0.029 in. to 1.000 in. in a short time on a cylindrical grinding machine.

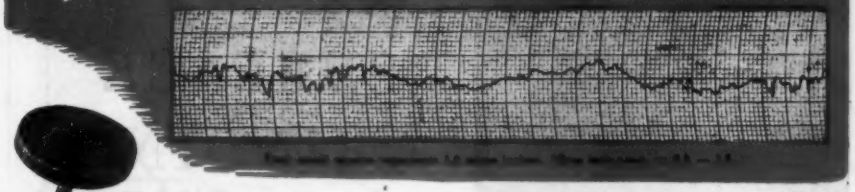
PNEUMATIC TOOLS A 32-page catalog covering the line of rotary pneumatic tools manufactured by the Aro Equipment Corp., Bryan, Ohio, is ready for distribution. It includes illustrations and specifications of models available for drilling, grinding, burring, and similar operations, and presents information on speed couplers, accessories and the new line of Aro impact wrenches.

REAMERS Specially designed for tool engineers, manufacturers and production men interested in new techniques and methods of manufacture, is a 32-page catalog on reaming operations and their effect on final cost published by the Madison Manufacturing Co., Muskegon, Mich.

REFRIGERATION York Corp., York, Pa., has issued a catalog of accessories and supplies for refrigeration and air conditioning plants. Included are pages of data and tables for sizes, weights, performance information, prices. The catalog is the looseleaf type and is divided into sections and tabbed for ready reference. Requests must be made on business letterhead.

REPRODUCTION "Hold Everything" is the title of a bulletin released by

Proof of a Better Finish



Surface Analyzer Tape Proves You Get a Better Finish With Chicago Wheels

These results were obtained at a rate of 10 pieces per hour in an aircraft parts plant. Material, X-13-15, Rockwell 60 to 57, grinds out .006 to .007 stock. Chicago Wheel used, ½ x ½ x ⅛", Grain 180, Grade L Arcite FV Bond. Spindle Speed 40,000 r.p.m. Lapping and super finishing eliminated on this job.

Can you match that finish? Sounds phenomenal, but you can do it with Chicago Wheels. And, the secret of their superiority lies in the new FV Bond, developed exclusively for Chicago Wheels, after 50 years' experience making wheels for the most accurate and precise applications.

Here's What FV Bond Will Do for You

- Reduce your wheel costs.
- Produce a better finish without sacrifice of production time — a finish so smooth that you can measure it in micro inches.

TRIAL WHEEL FREE!

Write or send the coupon today for a Chicago Wheel, made with this remarkable new FV Bond. Tell us grinder you use, size wheel and kind of material on which you will make your test.

For the duration, with full WPB approval, we are specializing on small sizes—anything up to 3" in diameter.

Write for Catalog and one of the new Engineering Survey Forms, a step in the direction of better finishing.

CHICAGO WHEEL & MFG. CO.

America's Headquarters for Mounted Wheels and Small Grinding Wheels

1101 W. MONROE STREET
Dept. AT, CHICAGO 7, ILL.

NAVY
MOUNTED WHEELS
SMALL GRINDING WHEELS

Half a Century of Specialization has Established our Reputation as the Small Wheel People of the Industry

AT-6

Send Catalog and Survey Form. Interested in ( ) Mounted Wheels. ( ) Grinding Wheels. ( ) Send Test Wheel. Size.....

Name .....

Address .....

SURFACE GRINDING *Expert*

Henry James supervisor of our surface grinding department, typifies the individual skill and specialized concentration which make an organization like Turner possible.

Henry, when only sixteen years old, cut his "eye teeth" on grinding with the Copper Range Consolidated Mining Co., at Houghton, Michigan, and has since specialized in surface grinding work and particularly on precision gauge and tool manufacture. This high degree of specialized career-work means craftsmanship and quality of the very highest order.

In the last war, he spent two years with the R.A.F. and was a mechanic on airplane parts. Then eighteen months with the Chevrolet at Flint and twenty years with the Ford Motor Company.

Since there is close harmony in the working of finely tuned precision machines, it is only logical that Henry's hobby should be singing.

Look for this stamp of precision. It is your guarantee of a Turner Precision Made Gauge.

TURNER BROTHERS

TURNER GAUGE GRINDING COMPANY

1625 HILTON ROAD • • FERNDALE MICHIGAN

TAPER RING AND PLUG SET

Turner taper rings and taper plugs can be furnished in sets of plug and ring as illustrated, or one check plug or one check ring with any quantity of the component parts.

The male or plug gauge is used for checking internal tapers and countersinks. Truncated taper plugs are used for checking root diameter of pipe threaded holes.

Microcopy Corp., 2800 West Olive Ave., Burbank, Cal. It describes a new and improved application of microfilming to pencil engineering drawing, valuable records, documents, maps and other such material. The bulletin also points out the time and monetary savings effected through the use of the Translite Hi-Reduction microfilm process.

ROTARY FILES The Rotary File Co., Stratford, Conn., has published a catalog on its complete line of hand-cut rotary files. The first part of the book traces the development of these files by the company. The remainder tells how these files are made, presents the various types and grades of files, and special shape files, gives table of specifications, and includes a section on the line of ground from the solid files and cutters manufactured by the Bridgeport Ground File Co., Stratford, Conn.

SCREWS The Waltham Screw Co., Waltham, Mass., has released a publication entitled "Three Generations of Yankee Ingenuity," the story of the company's progress during the past fifty years in the manufacturing and improvement of precision screws, and the individuals responsible.

SCREWS Useful engineering and production data about the application of self-tapping screws is given in a Users' Guide, offered to design engineers, chief draftsmen and production executives by the Parker-Kalon Corp., 204 Varick St., New York 14, N. Y. The book includes a selector chart and tables of recommended hole sizes, stock sizes and data on various types of screws for different applications in sheet metal, steel, castings, plastics, plywood and other compositions.

SPEED REDUCERS D. O. James Mfg. Co., Chicago, Ill., has published Catalog No. 1000-R, describing a complete line of gear speed reducers including herringbone, planetary, spiral bevel and worm gear speed reducers. Also included is the line of flexible couplings and automatic backstops. The overall catalog contains nine bulletins, each of which is devoted to one particular type of speed reducer, flexible coupling, or backstop.

TIMERS Bulletin No. WTTC-44, detailing specifications, features and applications of the new combination timer-contactor "package" units which are designed to provide low-cost automatic electronic control for resistance welders, is available from Weltronic Co., 19500 West Eight Mile Road, Detroit 19, Mich.

VALVES Eleven good tips on the handling and care of valves are graphically illustrated in the new "Do's and Don'ts" chart released by the Reading-Pratt & Cady Div. of American Chain & Cable Co., Inc., Bridgeport, Conn. These 11 × 17-in. charts are printed on heavy stock for posting.

NEW BOOKS

FATIGUE TESTS OF COMMERCIAL BUTT WELDS IN STRUCTURAL STEEL PLATES—*Published by The University of Illinois, Urbana, Ill., as Vol. 41, No. 8 of the Bulletin.* $1.

To gain comparative tests of fatigue strength of butt welds in ⅞ in. carbon steel plates, made in flat position under laboratory conditions and those made under commercial conditions, specimens were purchased from fabricating shops that have had extensive experience in structural welding. A third group of tests of commercial welds was made to determine the fatigue strength of butt welds in ⅞ in. carbon steel plates welded in various positions and with various electrodes.

The results of the tests of these various groups are detailed in text, charts, tables, photographs, macrophotographs, microphotographs and drawings.

•

ANGULAR SPACING TABLES—*Published by Vinco Corporation, 8855 Schaefer Highway, Detroit 27, Mich.* $10.

The included angle between any point of beginning and any one or more divisions of a circle, up to and including 200 divisions, is given in tables. These divisions are computed in degrees, minutes and seconds with decimals to the 1000th part of a second.

These tables are suitable for shop work and inspection, and the decimals may be used frequently in engineering departments for calculations.

Eye-easy green color backgrounds for every table, with horizontal lines, make comfortable reading. Pages are protected from grease and dirt by sheets of cellophane laminated to the paper. Plastic ring binding permits the book to lay flat at any page.

•

CONTROL OF ELECTRIC MOTORS—*By Paisley B. Hardwood, Manager of Engineering, Cutler-Hammer, Inc. Second Edition. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York, N. Y. Price,* $5.

Successful installations of electrically driven machines depend upon proper correlation of the machine, the motor and the controller. Knowing speed and torque requirements of the machine it is possible to choose a motor with the proper characteristics, and knowing the motor characteristics it is possible to select a controller that will cause the motor to perform the required functions. Thus, all those responsible for the purchase, installation and service of electrically

20% credit allowed on all new Dearborn Gage Block Sets when your used Dearborn Sets are sent in for Reconditioning

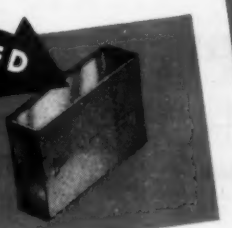
You can now turn in your used Dearborn Gage Block sets for reconditioning and we will send you a brand new set of Dearborn blocks (rectangular) and allow you 20% discount on the new set. Yes, these Dearborn sets will be new, not reconditioned, and they will all have the exclusive Ellstrom feature of Chromium Plated Gaging Surfaces, that insures longer wearing millionths.

On all other makes of gage block sets we will allow a 10% discount on a *new* Dearborn set when you turn in these used sets for reconditioning.

In addition to the discounts allowed we allow you to hold your *old* set until we deliver your new Dearborn Gage Block set. This is an added advantage, for it won't be necessary for you to interrupt your production schedules while you're waiting for the new set to arrive. Wire or write today for prices and delivery dates.

CHROMIUM PLATED ... for LONGER LIFE

Each gaging surface of a Dearborn Gage Block is Chromium plated by the exclusive Ellstrom process to give you longer wearing millionths.



DEARBORN GAGE CO. 22035 BEECH STREET DEARBORN, MICHIGAN

Originators of Chromium Plated Gage Blocks

NEW ELLSTROM ACHIEVEMENT

ROUND GAGES WITH *Chromium Plated* GAGING SURFACES

Here is one of the finest accomplishments in gage-making craftsmanship. The outstanding advantages of these Ellstrom round gage blocks over ordinary rectangular or square steel gage blocks are:

1. Almost entire area (.9970 square inch) of gaging surface can be utilized, which is double the area of the rectangular block (.4968 square inch).
2. Ellstrom's chromium-plating of gaging surfaces, which stops danger of corrosion and increases gage life many times over ordinary steel gage blocks.
3. New shape practically eliminates chances of tipping, and flats prevent rolling when placed on side as shown in photograph above.

Save the center

AND

SPEED THE JOB

DIXON'S
LATHE CENTER
GRAPHITE LUBRICANT

KEEPING dead centers of lathes lubricated with occasional dabs of ordinary oil or grease has ruined many a center and many a job. It takes more than "any" oil or grease to endure the pressures and speeds that set up ruinous friction and heat at the dead center. Dixon's Lathe Center Graphite Lubricant, a combination of pure flake graphite and extreme-pressure additives, insures effective protection against wearing, scoring and softening. Also excellent on steady rests and jack screws.

Use it for special lubrication services wherever extreme film strength is required. Distributors have it in 1, 4 and 8 ounce collapsible tubes.

JOSEPH DIXON CRUCIBLE CO., JERSEY CITY, N. J.
I am interested in trying DIXON'S LATHE CENTER GRAPHITE LUBRICANT.
My Supply Houses are:

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Name.....

Address.....

JOSEPH DIXON CRUCIBLE CO., JERSEY CITY, N.J.

Ticonderoga Graphite • No. 635 Graphite • Microfyne Graphite • Pipe Joint Compound • Graphite Sea Graphited Oils • Cup and Pressure Gun Grease Gear Lubricants • Waterproof Graphited Grease • Auto-Marine Grease • Graph-Air Guns • Belt Dressing (Contains no Graphite).

driven machines have an interest in motor controllers.

In revising his textbook describing control devices in common use, Mr. Harwood has elected to incorporate much of the material in chapters dealing with the types of motors to which they are applicable. This new arrangement gives a straightforward presentation of motor characteristics, control methods and control devices. Many new tables list the ratings of motors and controllers.

To satisfy a demand from readers, two new chapters are included: synchronous motors and variable-voltage control. In discussing the former, the author describes the construction of the synchronous motor, the general starting method and a number of methods for achieving synchronism when the motor is up to speed. The chapter on variable-voltage control considers governing the speed of shunt-wound d.c. motors.

•

THE OXY-ACETYLENE HANDBOOK—*Published by the Linde Air Products Company, 30 East 42 St., New York, N. Y. Price* $1.50.

This 600-page manual covers the range of the oxy-acetylene process, and gives instructions for handling all common metals, together with the principles of various methods for depositing and controlling molten metal. As such, the book will serve as a classroom text for teaching students how to weld and cut, and also as a reference for plant-management people. After covering the general principles of the oxy-acetylene process, the manual takes up the welding of ferrous alloys, the non-ferrous alloys, miscellaneous applications, cutting, inspection and management, and finally welding and cutting data. The book is well illustrated and printed, and is durably bound.

SEEN and HEARD

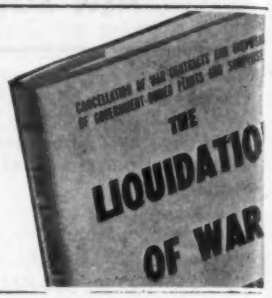
By JOHN R. GODFREY

Styles and Scraped Bearings

Styles, as has been remarked many times, are not confined to furniture or women's hats. Habits might well be included and all have their counterpart in machines of various kinds. I recall the difficulty that Winslow Blanchard had in convincing customers that the intersecting circular marks left by the wheel on work done on his grinders, made just as smooth a surface as that left by the old type peripheral wheel with the longitudinal travel. In the same way machine builders who finish bearing surfaces that do not require scraping, are usually compelled to "spot" them with

JUST PUBLISHED

CED
the new research study



THE LIQUIDATION of WAR PRODUCTION

★ Cancellation of War Contracts and Disposal of Government-owned Plants and Surpluses.

By A. D. H. KAPLAN, Professor of Economics, University of Denver.

133 pages, 5¾ x 8¼, $1.50

HOW will our war production be liquidated? To aid businessmen in considering their own specific questions of conversion, this new study from the Committee for Economic Development surveys the problem and suggests definite policies and methods of solution.

Clearly, concisely, authoritatively presented are the facts you want — the framework of reference that takes into consideration the magnitude of the job, the nature of the factors involved, and the procedures necessary to:

> "put productive enterprise in a physical and financial position to retool, to replenish its stock, to open up new lines in commodities and services, and thereby *to reemploy labor at wages that will sustain the nation's purchasing power.*"

Is it realistic to treat transition to peace production as a back-to-normalcy movement?

What will be the areas of distress requiring help until a peacetime balance can be restored?

What lessons do experiences following World War I teach?

What is the importance of timing of the reconversion program?

In many aspects such as these, the reconversion problem is examined in this book. The issues, the facts, the figures are extracted, placed in proper perspective, and simply stated for the busy business reader, and 41 concrete proposals are made for a program providing for a smooth transition to desirable postwar levels of production, employment, and wages.

JOHN M. HANCOCK, Office of War Mobilization, Washington, D. C., says, "I certainly feel that you have done a masterful job."

DR. SUMNER H. SLICHTER says, "I am enthusiastic about this report. It is realistic and to the point."

ASK TO SEE IT 10 DAYS FREE

SEND THIS McGRAW-HILL COUPON

McGraw-Hill Book Co., 330 W. 42nd St., N. Y. 18.
Send me Kaplan's The Liquidation of War Production for 10 days' examination on approval. In 10 days I will send $1.50, plus few cents postage, or return book postpaid. (Postage paid on cash orders.)

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MORE ACCURATE

HYDRAULIC PRESSURE CONTROL

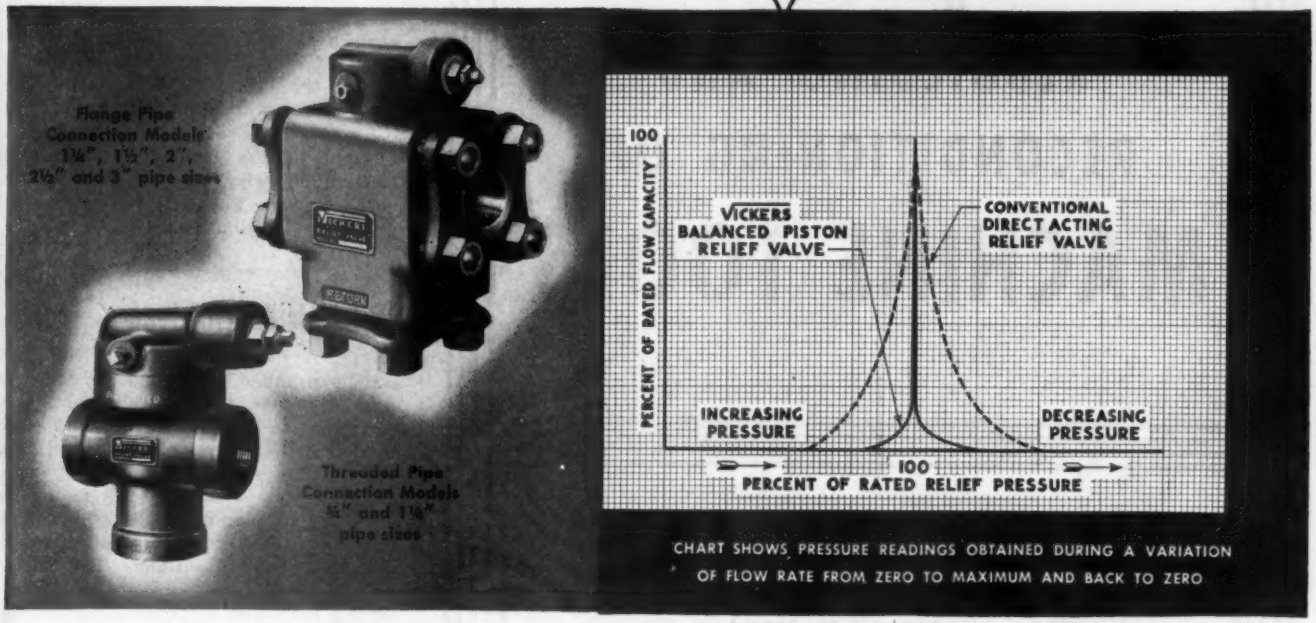

Flange Pipe Connection Models 1¼", 1½", 2", 2½" and 3" pipe sizes
Threaded Pipe Connection Models ¾" and 1¼" pipe sizes
100
PERCENT OF RATED FLOW CAPACITY
VICKERS BALANCED PISTON RELIEF VALVE
CONVENTIONAL DIRECT ACTING RELIEF VALVE
INCREASING PRESSURE
DECREASING PRESSURE
100
PERCENT OF RATED RELIEF PRESSURE

CHART SHOWS PRESSURE READINGS OBTAINED DURING A VARIATION OF FLOW RATE FROM ZERO TO MAXIMUM AND BACK TO ZERO

VICKERS

Balanced Piston Type

RELIEF VALVES

As indicated by the chart above, Vickers Balanced Piston Type Relief Valves have a negligible pressure variation throughout their capacity range. In these valves a hydraulically loaded and balanced piston takes the place of the customary spring-loaded direct-acting relief mechanism. This means more sensitive operation as well as greater accuracy throughout the wide pressure range.

This accuracy of control prevents pressure override when sudden changes in pressure occur in the hydraulic system. Compact design, longer operating life, installation directly in the pressure line, quiet operation, and simple adjustment are other advantages of these Vickers Balanced Piston Relief Valves. See Bulletin 38-3 for complete information.

Vickers Application Engineers will gladly discuss with you how Vickers Hydromotive Controls can be used to your advantage.

VICKERS *Incorporated*

1410 OAKMAN BLVD. • DETROIT 32, MICHIGAN

Application Engineering Offices: CHICAGO • CLEVELAND • DETROIT • LOS ANGELES
NEWARK • PHILADELPHIA • ROCHESTER • ROCKFORD • TULSA • WORCESTER

Representative of More than 5,000 Standardized Vickers Units for Every Hydraulic Power and Control Function

EXCEPTIONAL FACILITIES
for the
REBUILDING AND
RECONDITIONING OF
MACHINE TOOLS

In addition to the manufacture of heavy duty lathes for boring and turning, Sommerfeld Machine Company offers complete equipment and experienced personnel for the rehabilitation of machinery, as described below. If you are interested in having any of your machines restored to top-notch operating condition, get in touch with Sommerfeld!

ENGINE LATHES · TURRET LATHES
TOOL ROOM LATHES
HORIZONTAL & VERTICAL BORING MILLS
KEYSEATERS · GEAR CUTTERS
SLOTTERS · SCREW MACHINES
OTHER MACHINE TOOLS
SPECIAL MACHINERY

Sommerfeld
MACHINE COMPANY
BRADDOCK, PA.
Makers of Machine Tools since 1895

a scraper to give the illusion of being scraped to a bearing.

One well known builder, who knows that a properly machined bearing needs no scraping, recently tried an experiment along this line. He had two machines carefully checked to be sure the ways were as nearly perfect as possible and sent them out without spotting them. Both went to good mechanics who should have known better. But both buyers "regretted that the builder was so rushed he didn't have time to scrape the ways." The habit of seeing scraper marks was so strong that they couldn't believe the machine was finished.

I am reminded of the old superintendent of the Rolls-Royce plant in Springfield who said "after we machine a perfect surface we don't want any man digging it full of holes."

One Million Instead of Four

AN INDUSTRIAL ENGINEER who has laid out a number of plants, and taken part in modernization programs, asserts that manufacturers would do well to check their layouts and machinery installations every three to five years. He cited one example of a firm that expected to spend over $4,000,000 on a modernization program, including additional plant buildings. But as it turned out, the increased manufacturing load was handled satisfactorily in the original plant after a new layout was made, special-purpose machines were installed to increase output on bottleneck operations, worn general-purpose machines were replaced, and a suitable materials-handling system was installed. Modernization of the facilities cost approximately $1,000,000 as compared with the $4,000,000 anticipated.

Quick Clamping Fixtures

HIGH-SPEED machining operations may save much less than anticipated unless the time necessary for handling the work in and out of the machine can also be reduced. This is particularly true on short cuts. It is much less important on long cuts. A half minute saved in cutting time hardly counts if the handling time remains at five or even three minutes.

High cutting speeds puts it up to the fixture designer to simplify his clamping methods. In most cases screw clamps are too slow and are unnecessary. Cams and air or hydraulic cylinder can generally be used to advantage. In one western plane plant they buy small air cylinders by the hundred and store them in the toolroom. One of these air cylinders goes on every new milling fixture as they use high-speed milling in this shop. These cylinders also have other uses. By keeping a supply on hand there is no delay whenever a new fixture is needed.

For the First Time...

WRITE YOUR OWN SPECS!

STANDARDIZED AIR GAGE SPINDLES AND COMPONENTS

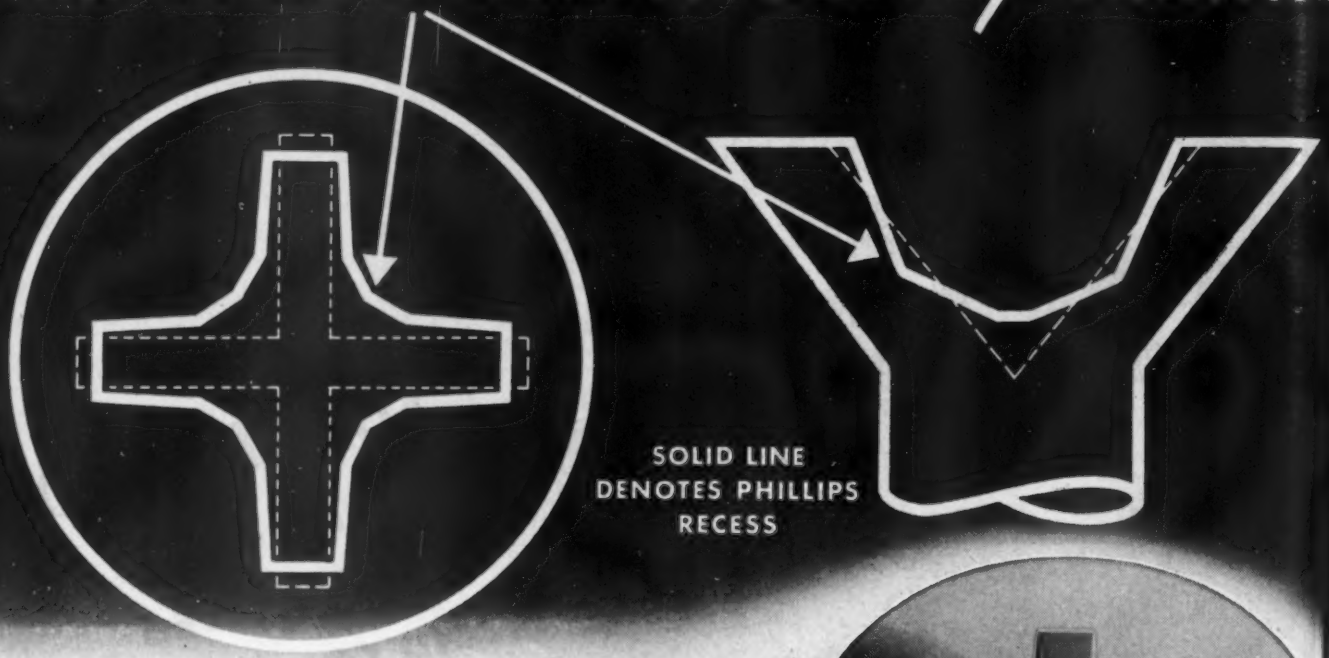
Sheffield Precisionaire spindles, adapters, etc., within certain limits, have now been STANDARDIZED so that any user can make up his own specifications almost as easily as he does for AGD plug gages.

Engineering time and charges are eliminated on STANDARD spindles and components. Delivery is shortened considerably. Components are interchangeable within certain size ranges which means minimum initial purchases and gage inventories.

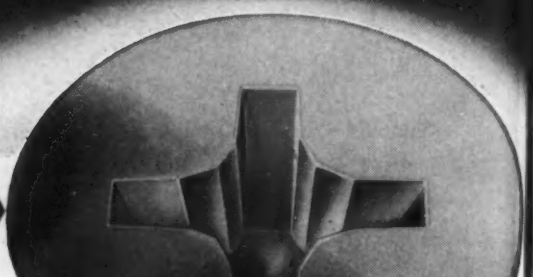
The STANDARD Precisionaire checks internal diameters of long, short, through, blind or counterbored holes. Both tolerance limits are checked in one operation faster than either can be checked with a plug gage—and without the human element of error. Precisionaire spindles will outwear plug gages 10 to 40 or more times.

Write for Engineering Data No. 12 on Sheffield STANDARDIZED Precisionaire Components and SPECIAL applications.

ONLY ONE *Recessed Head Screw has these 2 Trouble-Saving Features..*



It's PHILLIPS.. *the Engineered Recess*



The left-hand drawing shows how scientifically the center corners of the Phillips Recess are *engineered.* Instead of being squared, these corners are *rounded* in a series of flat planes, with every angle and every dimension making a definite contribution to driving efficiency.

This makes it possible for workers to utilize full turning power – without danger of burring or reaming out the heads of Phillips Screws.

Now examine the right-hand drawing. This shows *more* scientific engineering. Instead of being tapered to a sharp point that would weaken the screw shank, the Phillips Recess has a nearly flat bottom.

This makes it possible to set screws up uniformly tight without fear of screw heads shearing off. The flat bottom also permitted design of a stronger, longer-lasting driver point.

Only the *Phillips* Recess is engineered this way. Only when you specify screws with the Phillips Recessed Head can you get the freedom from trouble . . . the strength and driving speed these features make possible. You can get Phillips Recessed Head Screws in any head style, type, or size.

PHILLIPS *Recessed Head* SCREWS

WOOD SCREWS · MACHINE SCREWS · SELF TAPPING SCREWS · STOVE BOLTS

TO MAKE WARTIME QUOTAS AND PEACETIME PROFITS-- USE PHILLIPS SCREWS AND DRIVERS

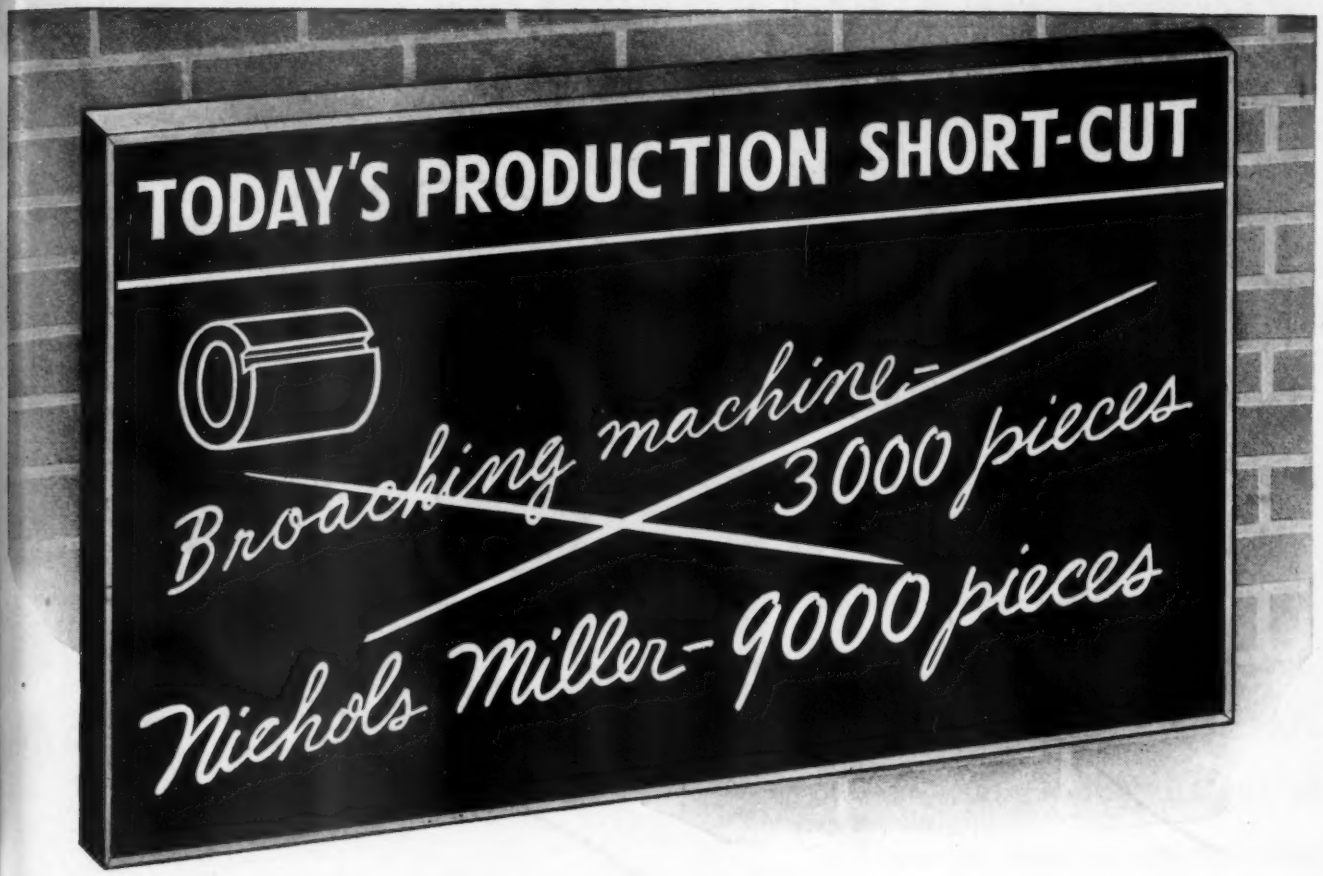
Faster Starting: Driver point automatically centers in the Phillips Recess . . . fits snugly. Fumbling, wobbly starts, slant driving are eliminated. Work is made trouble-proof for inexperienced hands.

Faster Driving: Spiral and power driving are made practical. Driver won't slip from recess to spoil material or injure worker. (Average time saving is 50%.)

Easier Driving: Able to utilize their full turning power, workers can maintain speed without tiring.

23 SOURCES

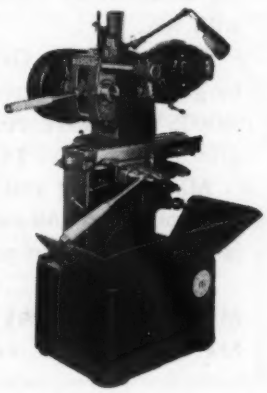
American Screw Co., Providence, R. I.
The Bristol Co., Waterbury, Conn.
Central Screw Co., Chicago, Ill.
Chandler Products Corp., Cleveland, Ohio
Continental Screw Co., New Bedford, Mass.
The Corbin Screw Corp., New Britain, Conn.
General Screw Mfg. Co., Chicago, Ill.
The H. M. Harper Co., Chicago, Ill.
International Screw Co., Detroit, Mich.
The Lamson & Sessions Co., Cleveland, Ohio
Manufacturers Screw Products, Chicago, Ill.
Milford Rivet and Machine Co., Milford, Conn.
The National Screw & Mfg. Co., Cleveland, Ohio
New England Screw Co., Keene, N. H.
Parker-Kalon Corp., New York, N. Y.
Pawtucket Screw Co., Pawtucket, R. I.
Pheoll Manufacturing Co., Chicago, Ill.
Reading Screw Co., Norristown, Pa.
Russell Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
Scovill Manufacturing Co., Waterville, Conn.
Shakeproof Inc., Chicago, Ill.
The Southington Hardware Mfg. Co., Southington, Conn.
Wolverine Bolt Co., Detroit, Mich.



MILLING a wrench slot in these rings was originally treated as a broaching operation until the job was put on a Nichols Miller. The work was simplified, and the output was increased from 3,000 pieces to 9,000 every twenty-four hours!

This is not an unusual situation for the Nichols Miller. It is often called upon to do the work of precision boring machines, lathes and grinders more economically.

That's why you can see Nichols Millers everywhere, performing many different high-speed machining operations under the same roof—on production lines, in toolrooms and laboratories. One is cutting hexagonal nuts, another is being used for wet grinding. Still another is doing precision turning in place of a lathe, and so on through a wide range of milling, boring, turning and facing applications—*to tolerances in "tenths."*



For the Nichols Miller is not an ordinary hand miller. Starting with the fundamental principle of bringing the cutter on a sliding head down to the work, W. H. Nichols & Sons has engineered around it a machine tool that permits countless precision operations heretofore considered only within the scope of heavier, costlier machines.

Whether yours is a large plant or a small shop, you will be interested in the "low-cost-per-piece-milled" advantages of the Nichols Miller. So why not write today for the 86-page handbook illustrating its many unusual applications?

MFD. BY W. H. NICHOLS & SONS, WALTHAM, MASS.

THE NICHOLS MILLER

"The Miller That Comes to the Work"

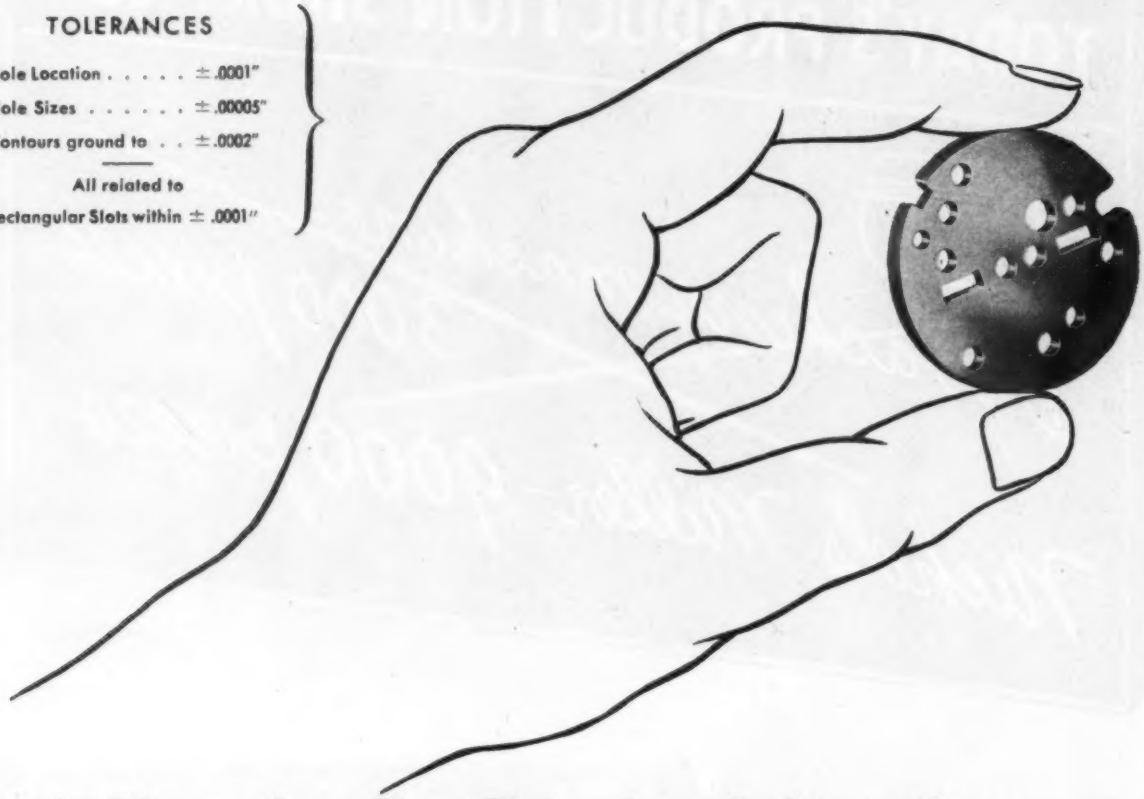
SOLE DISTRIBUTORS: NICHOLS-MORRIS CORP., CHURCH STREET, NEW YORK 7, N. Y.

A Tough Hole-Grinding Job?

TOLERANCES

Hole Location . . . . . ±.0001"
Hole Sizes . . . . . ±.00005"
Contours ground to . . ±.0002"

All related to
Rectangular Slots within ±.0001"



Here's How the Jig Grinder Solves It

It's anybody's guess how long this intricate hole-grinding job would normally take, using the tedious toolmaker's buttons and locating-plug methods...especially to such tolerances. But it's no problem for the Moore Jig Grinder.

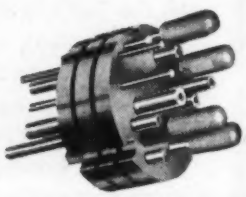
This unique machine precisely relocates holes and finish-grinds them within .0001". And then it checks its own work.

The master gage illustrated is one of many identical gages, each used by different manufacturers to determine the final production accuracy of a war-vital ordnance part. With the strictest interchangeability of parts called for—the burden of proof remains the gage's job. And, in turn, the accuracy of the gages depends on precision hole-grinding and finishing.

Toolmakers who measure their craftsmanship in strict tolerances find the Moore Jig Grinder the answer on all counts. You will, too.

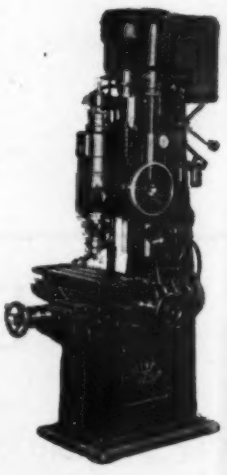
The Moore Jig Grinder has the capacity to grind holes from .030" to 4", provides .00005" per inch accuracy of lead screws and grinding speeds of 14,000 and 50,000 RPM.

May we send you a detailed bulletin on its application and ease of operation? There is no obligation, of course.



Proof of accuracy: Three individually ground master gages plugged together.

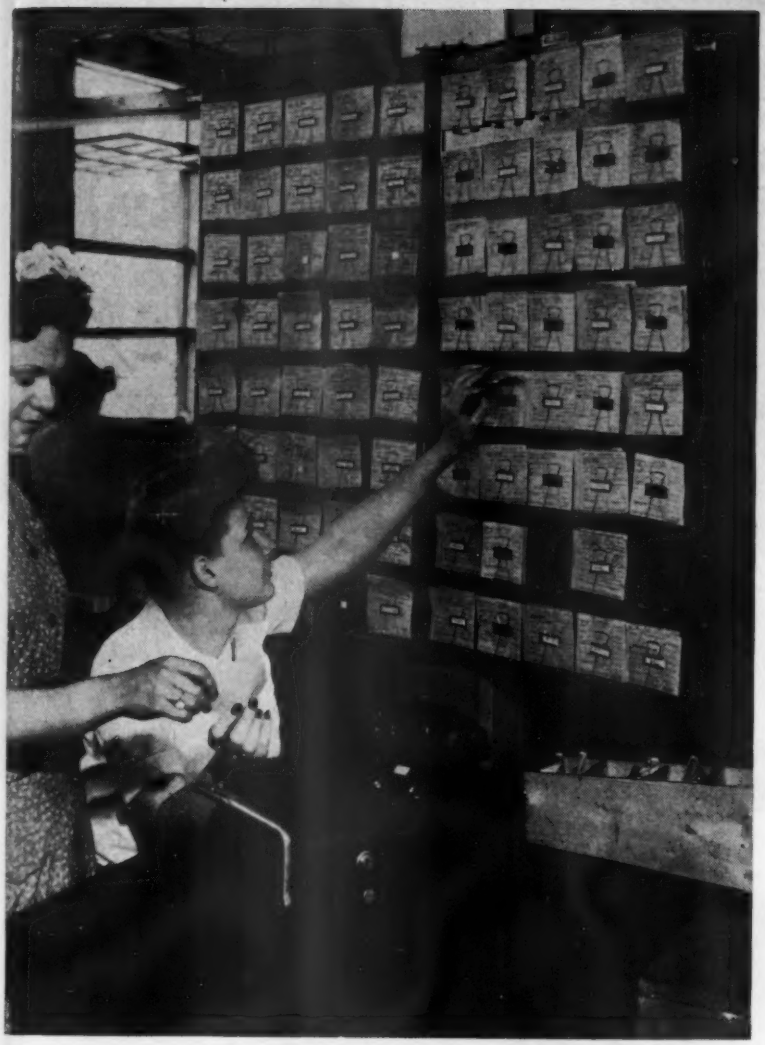
MOORE SPECIAL TOOL CO., INC.
738 UNION AVE., BRIDGEPORT 7, CONN.



P.S. All the holes in the gages illustrated were bored on the Moore Jig Borer. With its built-in system of coordinate hole location the Moore Jig Borer enables the operator to spot, drill, bore and ream all holes in a work piece with minimum tool changes. And its accuracy is held within .00025" in any position of the table. Investigate its advantages in your applications.

Moore Jig Grinder

THE ONLY MACHINE OF ITS KIND



SIMPLIFY YOUR *Machine Loading, Scheduling, Dispatching*

Simply file shop orders, dispatch orders, pre-written time tickets, tabulation or "Key-sort" cards, or other scheduling or job assignment tickets on McCaskey Machine Control or Planning Boards. No unusual time-absorbing procedures for personnel to master.

Many thousands of McCaskey machine control units are in use today, both for centralized machine loading and scheduling and departmental planning and dispatching. The status of each machine controlled is apparent at a glance — the job running, whether material is available for the next job to be run, other jobs scheduled, etc., etc.

The normal procedure, most frequently followed, is readily modified to suit specific needs. Numerous installations have been made in recent months without a single change in the factory forms already in use.

The system is easily made an integral part of production follow-up that is most effective in the control provided and surprising in the small amount of clerical work required. Accurate cost data also may be provided with a minimum of effort by including an extra copy of carbonized time tickets.

One eastern company, notable for its construction of specialized equipment to both the Army and the Navy, controls 3675 machines and assembly units in three plants on McCaskey Machine Control Boards. No modifications or additions to existing factory forms or records were required.

Don't delay preparations for the transitional period and for complete conversion. Write today for further information — or, without obligation, for the suggestions of one of our Industrial representatives.

THE McCASKEY REGISTER COMPANY, ALLIANCE, OHIO

McCaskey Systems Ltd., Galt, Ontario, Canada — *The McCaskey Register Co., Watford, England*

McCASKEY INDUSTRIAL CONTROLS

PRODUCTION • INVENTORY • MAINTENANCE • TOOLS • COSTS • PAYROLL

Our hat is in the ring!

IT'S election year here in America. The political campaign is on. But for more than political reasons, 1944 is a critical year for the industrial manufacturer.

The campaign plans for postwar business that you make this year will vitally affect your ability to meet peacetime competition, to keep your workers busy —yes, even to stay in business.

When it comes to the selection of the materials for your after-the-war product, there will be many worthy candidates competing for your vote—glass, plastics, wood, aluminum, magnesium, and new and better steel.

Steel—with its sphere of applications vastly increased by the impetus of war research — offers inherent advantages none of these other materials can equal.

For in steel you have a material of infinite resource and versatility. Unexcelled for structural strength per unit volume. Tough to resist wear, heat and corrosion. With the highest elastic stamina of any metal used to reduce weight. With superior ability to safely absorb shock, impact and vibration.

No manufacturer concerned about the future can afford to overlook steel's golden possibilities.

To help you get the most out of steel, the practical assistance of our metallurgists and engineers is placed at your disposal. Not only will they guide you in selecting the steels that best fit your needs, but they can show you how to apply these steels most economically.

CARNEGIE-ILLINOIS STEEL CORPORATION

Pittsburgh and Chicago

Columbia Steel Company, San Francisco, *Pacific Coast Distributors*

United States Steel Export Company, New York

Steels that meet the challenge of today and tomorrow

U·S·S CARILLOY ALLOY STEELS — S.A.E. and Aircraft Quality Steels for the special jobs of industry.

U·S·S HIGH STRENGTH STEELS to carry high unit stresses and to reduce weight to a minimum at low cost.

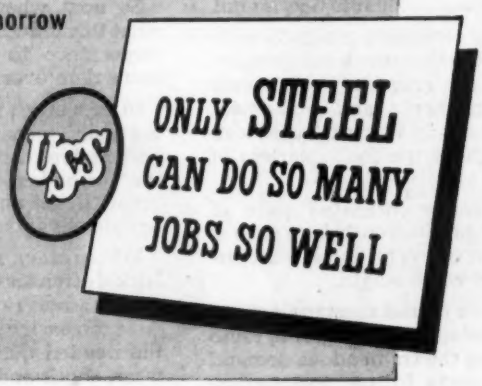
U·S·S ABRASION-RESISTING STEELS to combat wear and friction.

U·S·S COPPER STEELS to give twice the atmospheric corrosion resistance of regular steel at little additional cost.

U·S·S HOT-ROLLED AND COLD-ROLLED STEELS to provide the basic advantages of steel, plus maximum economy.

U·S·S STAINLESS AND HEAT-RESISTING STEELS to endure temperatures disastrous to other metals—to resist highly corrosive environments.

U·S·S NE-ALLOY STEELS developed to conserve critical alloying elements. Have proved so efficient that they will rate high in post-war applications.



UNITED STATES STEEL

NICKEL AIDS THE COMMUNICATIONS INDUSTRY

to KEEP 'EM IN TOUCH!

In the tradition of Morse and Bell and Marconi, the communications engineer carries on today.

His work, always valuable, now is vital.

No military campaign proceeds without it. The close teamwork between air, ground, and sea arms is possible only through instruments and equipment that keep them in touch though scattered throughout the four quarters of the globe.

And the vastly increased pace of modern war production brings with it increased use of every home-front circuit, line and wave-length.

All branches of the communications industry ... telephone, telegraph, radio ...are *meeting* the tremendous demand for their products. In war, communication engineers are taking advantage of their long peacetime experience with metals and alloys.

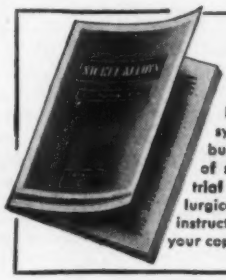
Time and time again this experience has shown them that a little Nickel goes a long way in improving other metals.

So now, when the dependability of what this industry makes is of supreme importance to the Nation, it favors more than ever the use of Nickel.

In repeaters, relays, magnetos, loading coils, transformers, loud-speakers and modern cables...even in the molds that form plastic radio parts...they call upon Nickel and its alloys for several unique advantages.

When other metals lack toughness, Nickel often supplies it. When they lack strength and fatigue resistance or corrode too easily, adding Nickel provides the needed qualities. Under abrasion, wear, shock and stress metals perform better *with* Nickel than *without*.

In the communications industry, as in many another, the knowledge, experience and cooperation of our staff has been at the disposal of technical men. Whatever *your* industry may be...if you want help in the selection, fabrication, and heat treatment of alloys... similar counsel and data are at your service.



Catalog "C"

makes it easy for you to get Nickel literature. It gives you capsule synopses of booklets and bulletins on a wide variety of subjects — from industrial applications to metallurgical data and working instructions. Why not send for your copy of Catalog C today?

* Nickel *

THE INTERNATIONAL NICKEL COMPANY, INC., *67 Wall St., New York 5, N. Y.*

From the record...
in FORGING 3" SHELL CAPS

STEEL "X" = 3,500 pieces
STEEL "Z" = 8,000 pieces

but...

16,000 pieces with HOTFORM

DIE STEEL

Vanadium-Alloys
STEEL CO. LATROBE, PA.

CM COMET

HOIST-POWER helps manpower to be more productive

Capacities from ½th to 1 ton. Available for plug-in on 110, 220 or 440 volt circuits. One-hand control. Prices from $130.

Materials handling is said to represent the largest single labor cost in industry—the largest single use of manpower. CM Comet Electric Hoists can make this same man (and woman) power more productive, more efficient and with less fatigue. From "receiving", through the production line, to "shipping", CM Comets are doing an outstanding job in making both ends meet. Write today for CM Bulletin 138 for the entire illustrated details.

CHISHOLM-MOORE HOIST CORPORATION

(Affiliated with Columbus-McKinnon Chain Corporation)

GENERAL OFFICES AND FACTORIES: 128 Fremont Ave., TONAWANDA, N.Y

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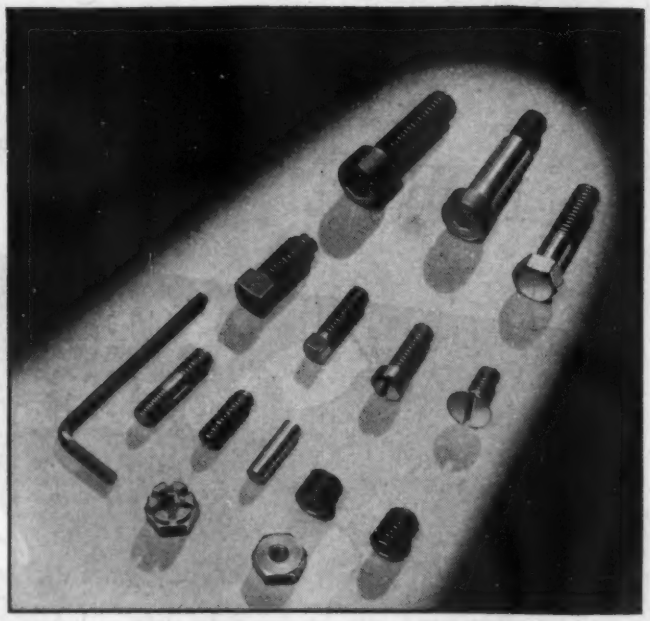


15 Top Quality Standard Screw Products

available from one reliable source

Buy your requirements of any or all of the 15 items illustrated above from a distributor of products made by The Chicago Screw Company. It will mark the end of quality problems and the beginning of speedy, trouble-free assemblies . . . Every item in this popular line is of excellent quality, in keeping with the fine reputation our company has gained through 72 years experience in the manufacture of threaded products.

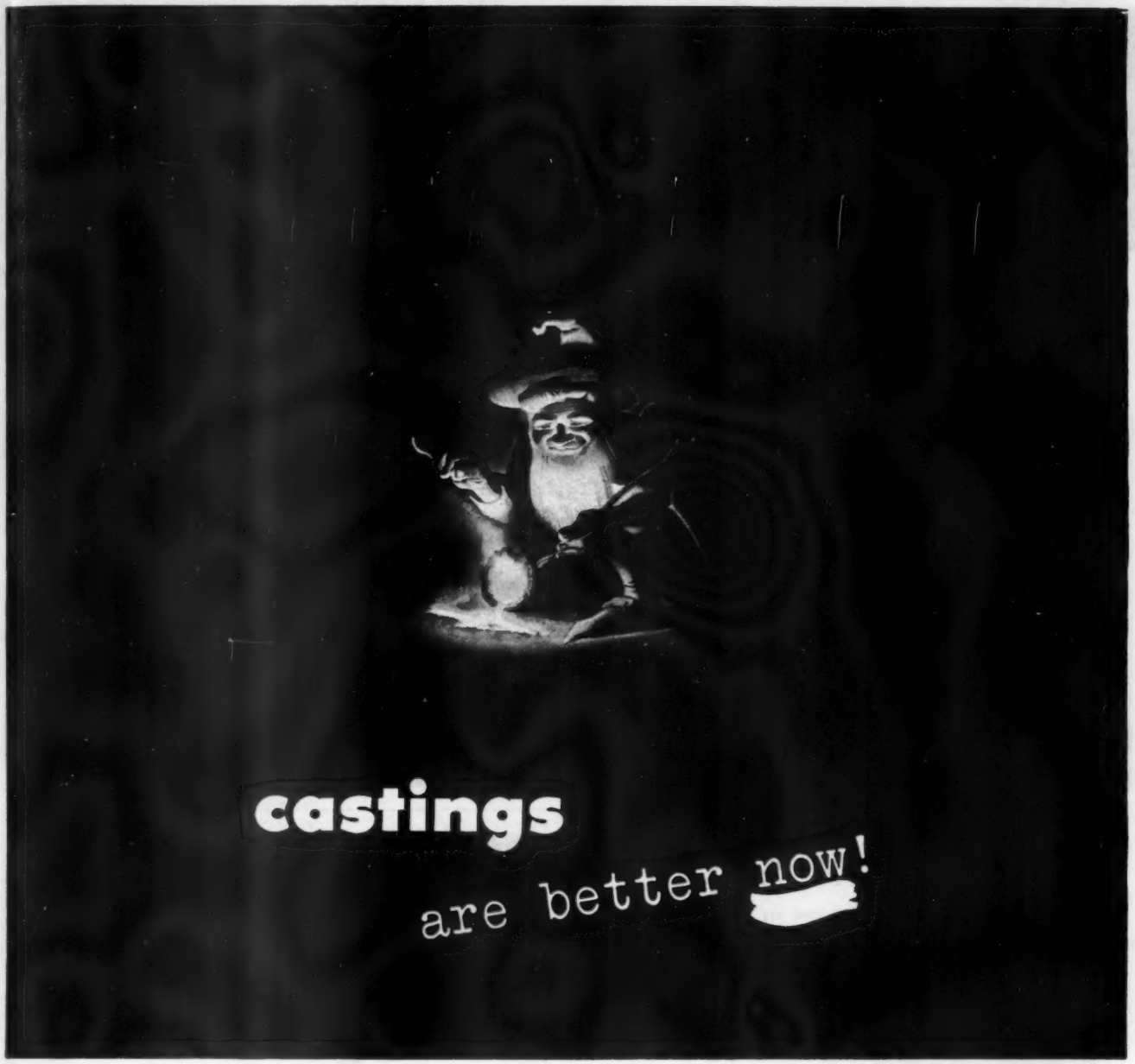
ARMY E NAVY

These Fine Products are sold only thru Authorized Distributors

THE CHICAGO SCREW CO.

ESTABLISHED 1872

1026 So. Homan Avenue — Chicago, Ill.



With new formulas, new procedures, new tests and controls, the foundryman has come a long way. Time was when an iron or steel casting was just a molded object of indefinite character. Now, more often than not, it is an embodiment of specified properties for exact engineering uses. In conjunction with the great improvement of welding and with other factors lately developed, this brings us to a new Machine Age.

Alloys have a growing importance. On metallurgical materials and their effects, knowledge is highly specialized. Seemingly slight differences lead to widely different results. The best advice obtainable and the most careful attention to details, are conditions of success. For those who keep up with the advance, there are great things ahead.

Inquiries concerning any use of Boron, Tungsten, or Molybdenum will be welcomed by the Molybdenum Corporation.

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Offices: Pittsburgh, New York, Chicago, Detroit, Los Angeles, San Francisco, Seattle.
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MOLYBDENUM CORPORATION OF AMERICA
GRANT BUILDING PITTSBURGH, PA.

MCA

THERE'S NO PRIORITY ON IDEAS!

Tom! See what "OH-38" can do for us! RM

● Here's Your Metal for Post-War Products . . .

No matter what products you are planning to make for the post-war era, from heavy machinery to household utility articles, there are component parts which can be made better, faster, cheaper—with OH 38.

It's an aluminum alloy—easily machinable—easy on tools—holds threads without stripping—weighs .106 pounds per cubic inch—elongation 2% to 4%—non-corrosive, non-oxidizing, non-magnetic—does not require heat treatment—polishes to silver mirror brilliancy—takes chrome, nickel or tin plating—may be annodized—many other manufacturing advantages.

OH 38 has proven itself with 5 years use in hundreds of plants and it's used only in castings by Hedstrom.

Send for complete technical information

HEDSTROM

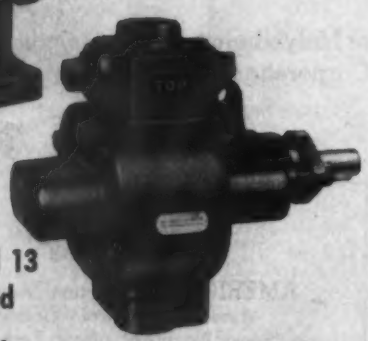
OSCAR W. HEDSTROM CORP. 4812 West Division St., Phone Columbus 3667, Chicago, Ill.

Manufacturers of Aluminum, Brass, Bronze and High Conductivity Copper Castings. Pattern Makers. Complete Mechanical Assemblies and Models to Specifications

REVERSIBLE STYLES

MAINTAIN SAME DIRECTION OF DELIVERY WHEN ROTATION IS REVERSED . . . . .

No. 8 Vane
Capacity
.23 to 1.37 G. P. M.



Nos. 11, 12 and 13
Rotary Geared
Capacities
1.6 to 17.2 G. P. M.

B·S Catalog listing complete line of Brown & Sharpe Pumps including performance charts and installation diagrams sent upon request. Brown & Sharpe Mfg. Co., Providence, R. I.

GEARED — VANE — CENTRIFUGAL — MOTOR DRIVEN

BROWN & SHARPE PUMPS

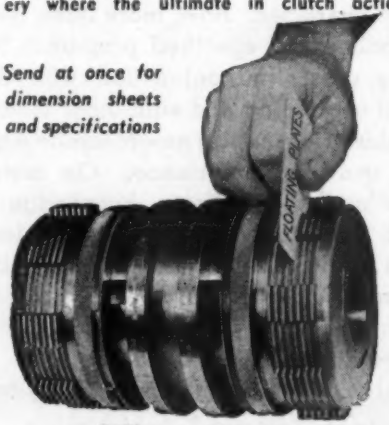
THE JOHNSON FRICTION CLUTCH

Single

THE NEW "MAXITORQ" IS IDEAL FOR MACHINE TOOL APPLICATIONS

"MAXITORQ" FLOATNG TYPE MULTI-DISC CLUTCHES are recommended for power transmission applications where smooth engagement, quietness, cool running without drag and quick, positive disengagement are required. They are especially adaptable to machine tool use and other types of industrial machinery where the ultimate in clutch action is of paramount importance.

Send at once for dimension sheets and specifications



Double

Features include floating discs which assure minimum drag, easy manual assembly and quick easy adjustment. They are compact, simple and require mimimum attention. Made in capacities from ½ HP to 5 HP at 100 R.P.M. in single, double and cut-off coupling types.

WRITE FOR MULTI DISC CLUTCH CATALOG NO. 74 OR CONSULT SWEET'S OR THOMAS' REG.

THE CARLYLE JOHNSON MACHINE CO. MANCHESTER, CONN.

COMPLETE *Variable Speed* POWER UNIT

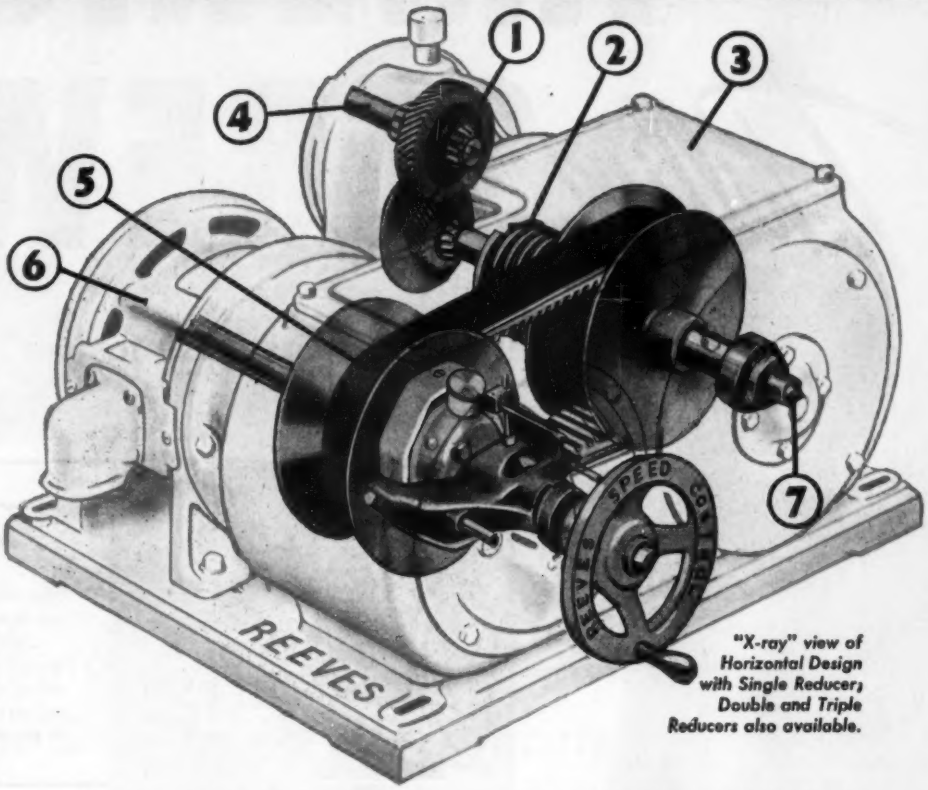
1. HELICAL TYPE GEAR REDUCER provides quiet transmission of gear load, better load distribution, longer life. Two or more angle-cut teeth in constant contact across gear face.

2. TENSION SPRING mounted on variable speed shaft, holds V-belt positively and automatically against disc faces. Makes it possible to secure maximum tension on belt at maximum speed, when maximum h.p. is required on unit and machine.

3. ACCESSIBILITY TO OPERATING PARTS OF REEVES MOTODRIVE is quick and easy. Simply remove four cap screws from cover plate. Removal and replacement of V-belt is readily accomplished.

4. OUTPUT variable speed shaft may be extended on either side of case—with or without reducer. A great convenience where wall, post or other obstacle might otherwise interfere; 13 different assemblies as to positions of motor, handwheel, shaft extension and reducer.

5. V-BELT is strong, endless cord construction, and held to minimum thickness to assure cool running and longer life. Very flexible, practically stretchless, of high tensile strength, evenly balanced in weight for proper load distribution. Transmits power smoothly and positively—without fluctuation or slippage.



"X-ray" view of Horizontal Design with Single Reducer; Double and Triple Reducers also available.

6. ANY standard foot-type, constant speed, ball-bearing motor may be used. Also several flange type motors.

7. CONVENIENT LUBRICATION—All operating parts lubricated through six force-feed fittings and 1 cup-type.

REEVES Motodrive

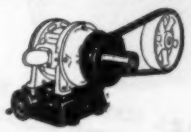
Motor Plus Variable Speed Plus Gear Reducer in one Compact, Enclosed Unit

Output speeds from 1.35 to 3480 r.p.m. may be secured with the REEVES Motodrive through the many different combinations of sizes, speed ratios and reduction gears available. Thus this modern, totally enclosed, compact unit meets practically all requirements for variable speed within 15 h.p. capacities. Widely used on machines where space is limited or where direct connection between motor and machine is desirable. Takes any standard foot-type, constant speed motor. Like all REEVES units, the Motodrive is simple, rugged, accurate. Transmission of power is absolutely positive at all speeds. Handwheel or Electric Remote Control. Space-saving vertical and horizontal designs. Easily applied to any driven machine. Write for Catalog A-441, giving full information.

REEVES PULLEY COMPANY • COLUMBUS, INDIANA

The Two Other Basic Reeves Units

VARIABLE SPEED TRANSMISSION for providing infinite speed regulation over wide range—2:1 to 16:1. Sizes fractional to 87 h.p.



VARI-SPEED MOTOR PULLEY converts any constant speed motor to a variable speed drive within 4:1 ratio. Sizes to 15 h.p.

REEVES *Accurate Variable* Speed Control

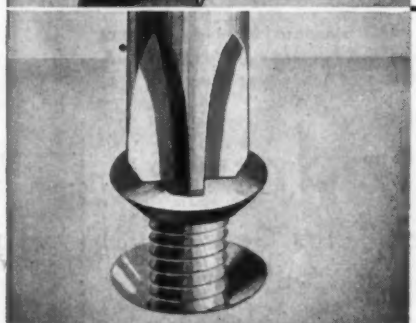
AMERICAN Phillips SCREWS

are faster . . . and cost less to use . . . because they're

ONLY PHILLIPS SCREWS HAVE THE ENGINEERED TAPERED RECESS

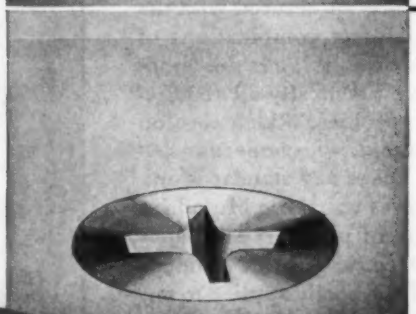
Fumble-Proof

The American Phillips *Recessed Head* fits firmly onto the 4-winged driver . . . which can't slip out or twist out in any direction. So the faster methods of driving (spiral and power) are safe to use. No fumbling, no dropping of screws. *Time is saved.*



Self-Aligning

The American Phillips Screw and Driver form a single unit that is automatically self-aligning. No fussing around to get a straight start, no fatiguing nerve strain which leads to poor work that must be done over. Here again . . . *time is saved.*



Straight-Driving

The American Phillips Screw and Driver *stay in alignment* under the stress of the driving operation. So the screw can't be driven any way but straight. No burred heads, no scarred work. Screw head is set up tight and flush *every time. Total time savings:* UP TO 50% . . . not to mention savings of screws and materials.

AMERICAN SCREW COMPANY

PROVIDENCE 1, RHODE ISLAND

Chicago 11: 589 E. Illinois St. • *Detroit 2:* 502 Stephenson Building

Put the Screws on the enemy... BUY BONDS!

No need to "do without"— Bronze Welding is Industry's No. 1 Tool for Salvaging Worn Parts

For building-up worn surfaces or making repairs to cast iron, malleable iron, steel or copper alloy parts, there's nothing so economical and dependable as Bronze Welding. That large bearing, for instance: It was worn out giving years of service on a nail making machine. Replacement from stock was impossible, yet the manufacturer just couldn't "do without." Built up with strong, tough, dense-grained Anaconda Manganese Bronze Welding Rod and machined, the bearing was quickly returned to service.

Or that 5,000 hp. turbine runner: Stones and gravel brought in with ice in the Spring badly damaged some of the buckets while others were broken off completely. Again Bronze Welding was used to build up the worn surfaces and weld in new patches. The cost, compared with that of a new runner, was negligible.

Maintenance men everywhere are taking advantage of the salvage and repair opportunities made possible with the oxy-acetylene torch and such rods as "997" Low Fuming, Tobin Bronze* and other Anaconda Welding Rods. Applications of these rods are described in Anaconda Publication B-13. Write for a copy.

*Reg. U. S. Pat. Off.

Here's a Suggestion List

Parts and place where Bronze Surfacing will "make it do"

Sheaves
Pulleys
Clutches
Thrust Plates
Bushings
Bearings
Hubs
Flanges
Pistons
Impellers
Pump Parts
Pipe Threads
Stripped Holes
Gear Teeth
Reciprocating Parts
"*Safe-ending*" Hammer Struck Tools

THE AMERICAN BRASS COMPANY

General Offices: Waterbury 88, Connecticut · *Subsidiary of* Anaconda Copper Mining Company

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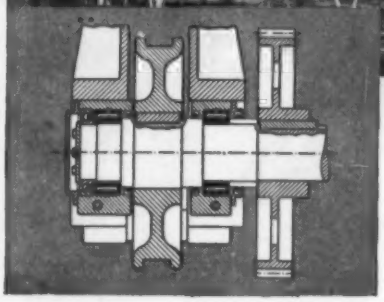
4451

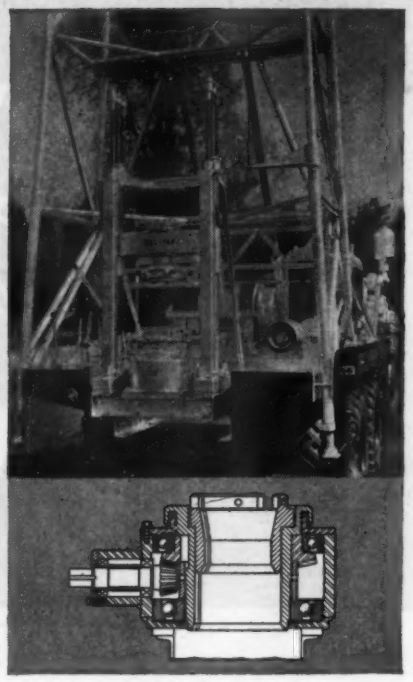
ANACONDA from mine to consumer

Anaconda Bronze Welding Rods

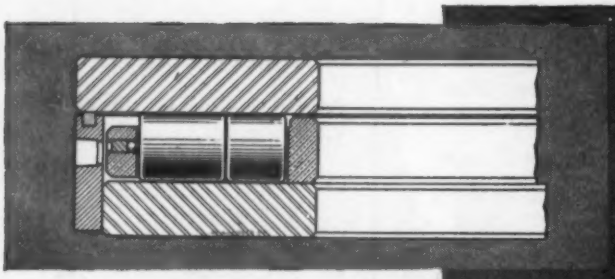
IN THE NEWS
WITH TORRINGTON BEARINGS

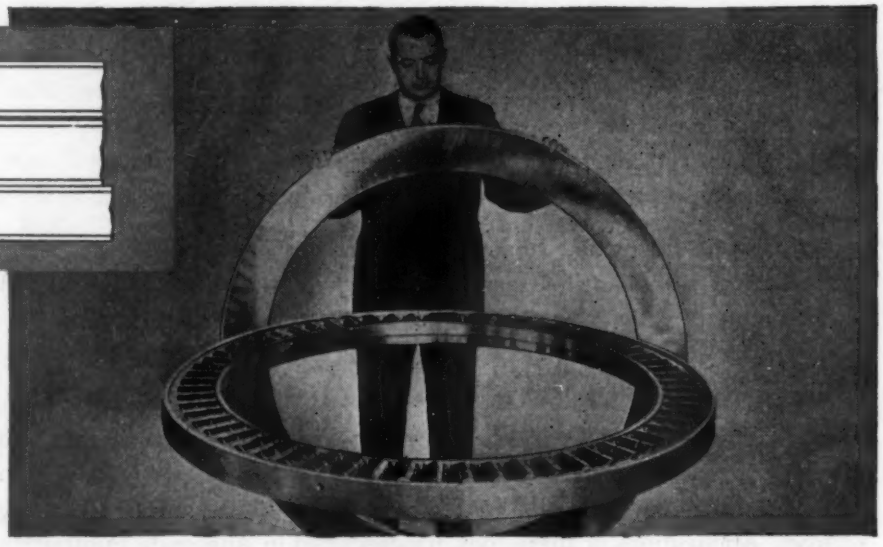


THE TREMENDOUS LOADS of this 15-ton overhead traveling crane in the Gary Steel Works of Carnegie-Illinois Steel Corporation are entrusted to bearings supplied by Torrington's Bantam Bearings Division. Two sets of Type NCS Heavy-Duty Needle Bearings, selected because of their high load capacity and compact design, are used in each axle housing, Torrington Ball Radial Bearings taking up the thrust load.



PLOTTING THE UNDERGROUND topography to determine where oil producing wells should be drilled is the important operation performed by this complete portable drilling unit manufactured by the Sullivan Machinery Company. To withstand the shocks, due to sudden changes in resistance as the drill bores through successive strata of soil, sand, water and solid rock, Torrington Ball Radial Bearings were selected for use in the rotary table assembly, as shown in the accompanying cross-section.





THIS HUGE ROLLER THRUST BEARING, measuring 53.125" O.D., is an example of Torrington engineering facilities for designing large bearings to carry extremely heavy loads. Its assembly includes 68 rollers 2" long and 1.5" in diameter; 68 rollers 1.375" long and 1.5" in diameter. The bearing is employed in the revolving mechanism of a large charging crane which serves the plate mill pre-heating furnace in one of the nation's major steel plants. Cross-section shows how felt packing was used to prevent entrance of scale and foreign matter during operation of the crane.

WHEN YOU SPECIFY Torrington Bearings, you have available specialized engineering service based on many years of experience with all types of bearing applications. Whether you need counsel on standard or custom-built bearings, TURN TO TORRINGTON.

ARMY E NAVY

TORRINGTON BEARINGS

STRAIGHT ROLLER • TAPERED ROLLER • NEEDLE • BALL

THE TORRINGTON COMPANY • BANTAM BEARINGS DIVISION

SOUTH BEND 21, INDIANA

24 HOURS A DAY . . . EVERY DAY FOR FIVE YEARS!

Six strand Veelos V-belt on Stamco Automatic Resquaring Unit.

HARD at work in a steel plant . . . 24 hours a day for 5 years . . . the Veelos V-belts on a Stamco Automatic Resquaring Unit are still giving "very satisfactory service." Only shutdowns in that period have been for machine lubrication and changing blades on shears.

And that Stamco unit does a tough job . . . the resquaring of steel plates and sheets. The performance of this installation proves that Veelos V-belts provide:

1. Longer Belt Life. Three Veelos features combine to provide longer belt life: **A.** The reduction of bending stress by Veelos' extremely flexible laminated link construction. **B.** Uniform distribution of the load on all strands through equalized tension. **C.** Perfect fit in the groove on all sheave diameters.

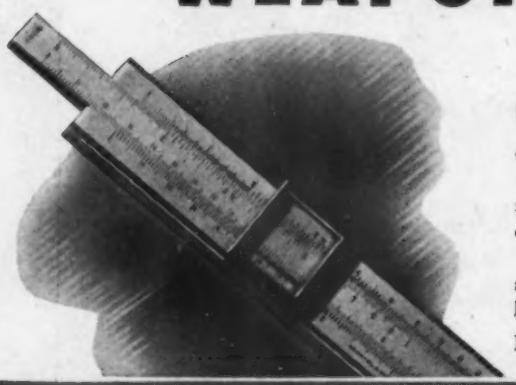
2. Adjustability for Continuous Machine Production. With Veelos in rolls, V-belts can be adjusted or replaced in a few minutes or less . . . maintaining machine production . . . reducing machine downtime.

Belt drives that maintain continuous production over a long life are worth learning about. Write today for *free 8-page illustrated manual* giving Veelos applications, construction detail, installation directions and engineering data.

MANHEIM MANUFACTURING & BELTING CO.
MANHEIM, PENNSYLVANIA

LINK CONSTRUCTION UPS PRODUCTION

WEAPONS OF PEACE!

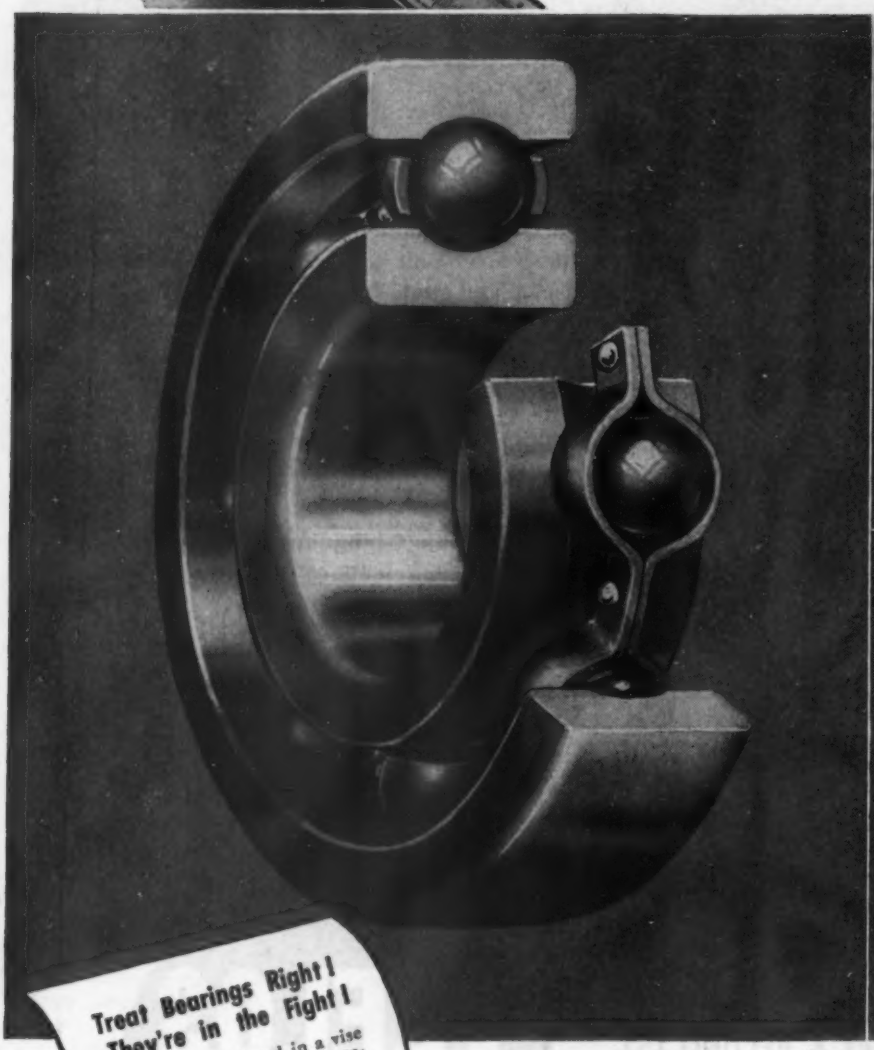


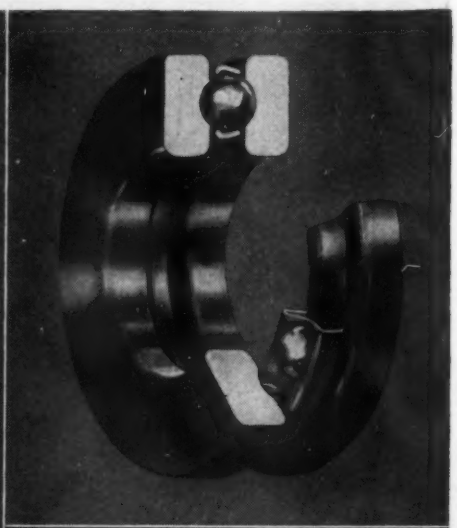
ORDNANCE OFFICERS will tell you that ball bearings are weapons of war. Cut off a nation's supply of ball bearings, they'll say, and you deprive it of military mobility.

BCA Ball Bearings will also be weapons of *peace*... weapons of the designers and engineers who will spearhead the fight for wider acceptance of American machines... tools... cars... trucks... tractors.

The time to consider how BCA Ball Bearings may help *you* in that fight is *now*. Plan your use of BCA's *before* the reconversion. It's one step that will help you avoid the risks of production and sales lag.

BEARINGS COMPANY OF AMERICA, LANCASTER, PENNA.





Treat Bearings Right! They're in the Fight!

1. If shaft is placed in a vise when mounting bearings, protect the shaft with soft metal, wood, cardboard or paper.

2. Be sure housing covers are tight. They are designed to keep lubricant in... keep dirt out. They can't do either if they're loose.

3. Store bearings in a dry place.

BCA

RADIAL • ANGULAR CONTACT • THRUST

BALL BEARINGS

Shaping things to come...

● Without in any way impeding our all-out war effort, Buffalo Bolt is ready now to discuss your fastener requirements for peace-time products.

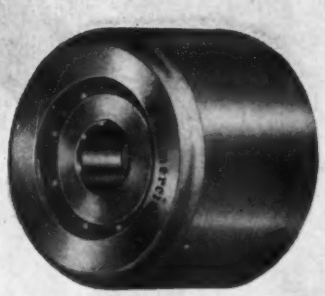
BUFFALO BOLT COMPANY

ARMY E NAVY

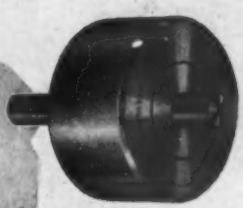
NORTH TONAWANDA, N. Y.
SALES OFFICES IN PRINCIPAL CITIES

The quality of Circle B products begins in our own rolling mill.

EFFICIENT BALL BEARING PERFORMANCE



FOR THE DURATION, WE ARE UNABLE TO SUPPLY MANY TYPES OF BEARINGS FORMERLY MANUFACTURED



"Commercial"
ANNULAR BALL BEARINGS

THE SCHATZ MANUFACTURING CO.
POUGHKEEPSIE, N. Y.

REPRESENTATIVES LOCATED AT
Detroit: 2640 Book Tower • Cleveland: 402 Swetland Building
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LIGHTNING *fast* DELIVERY

NUBON service is smashing all records—with guaranteed 10-day delivery of precision-built NUBON Grinding Wheels—even faster service in emergencies!

How are we doing it?—By our *Controlled Trial Plan* of engineering which assures accurate, uniform Grinding Wheels built to your specifications. Our plant is part of your laboratory! That's only half the story. Our *Special Bonding Process* saves precious hours in processing time.

Here's what NUBON service means to you: CUSTOM-MADE Grinding Wheels you can depend on, when you need them; elimination of big inventories of useless wheels. No wonder more and more industrial leaders are turning to NUBON for fast, dependable service.

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UNIVERSAL WHEEL & ABRASIVE CORP.

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NUBON 24 HOUR PROCESS GRINDING WHEELS AND STONES

NOW More Important THAN EVER

Fig. 928. "HALLOWELL" STEEL WORK-BENCH with laminated wood top. Available *immediately* in seven different lengths; four different heights; with two or three legs; with 1¾-inch or 2⅝-inch planking in top; with medium or heavy legs. Drawer is extra. Patented and Patents Pending. Immediate delivery.

HALLOWELL

SHOP EQUIPMENT OF STEEL

You save a lot of time when you buy "HALLOWELL" WORK-BENCHES OF STEEL.

You also save money.

Furthermore, you know at the outset, *before you buy*, exactly what the cost will be.

Compare the ease of choosing exactly the types of benches you need with the fuss and bother of building your own. Think of the time and trouble you would save by making a quick selection from the "HALLOWELL" Catalog and getting immediate delivery!

Fig. 1734. "HALLOWELL" DE LUXE STEEL BENCH with Backboard, lower Shelf and two cabinets with receding doors; one unit shown open. Designed in a number of arrangements to meet fully the specific needs of modern industry. Available *NOW*.

In the "HALLOWELL" line of steel work-benches there are 1367 different ready-made combinations to select from. You can get just what you want in height, width, number of legs, drawers, shelves, etc.; with steel, Masonite or laminated wood tops.

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Send for the "HALLOWELL" Steel Shop Equipment Catalog giving complete information regarding these ruggedly constructed, long-lasting, correctly designed work-benches of steel.

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It's a compact, multi-purpose piece of equipment—small enough to move easily wherever needed—so low in cost that everyone can have one or a half dozen as needed.
NOW, you really can't afford NOT to own a full automatic.
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It's self contained, shipped assembled, in one freight car, ready to set on your floor.
Write for our detailed bulletin on this machine. We'll gladly answer your questions.
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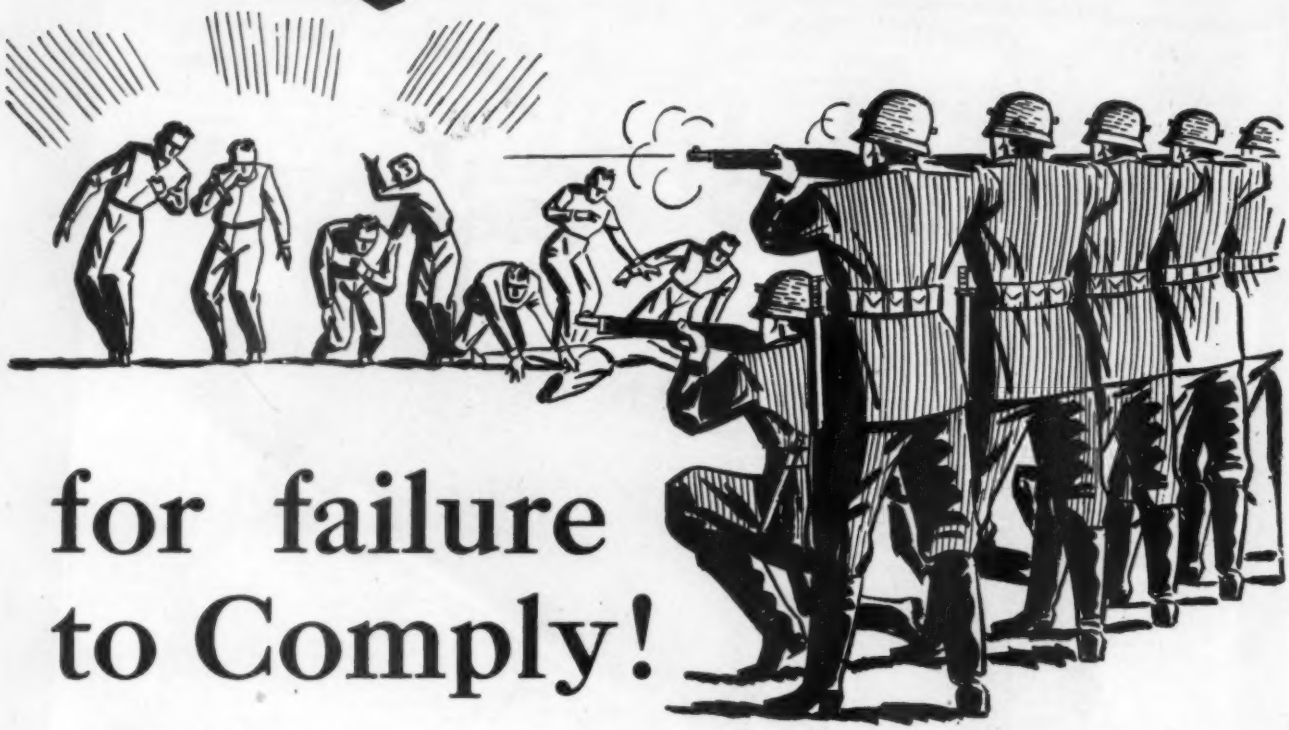
LIQUIDATED



for failure to Comply!

"Failure to comply" means death for many during war time.

"Failure to comply" with the stringent demands of modern technological advancement means death for many manufacturing concerns during peace time. War is ruthless—so is competition.

Compliance with the quickened tempo of the times, the demand for improved products at lower cost and better and faster production is necessary. Yesterday's machines and methods are no good tomorrow. It is better to liquidate them now than to be liquidated by them later.

Welco engineers are prepared to plan with you now the powering of your products to the tempo of tomorrow . . . to help make your products and methods more efficient—more dependable. All Welco Torque Motors are custom-built for a specific job. They make it possible to concentrate a specified amount of power in the smallest possible dimensions . . . enable the machine manfacturer to accomplish operations on his machines in less complicated, less costly and better appearing methods.

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What is your Powering Problem? . . . Write today!

THE B. A. WESCHE ELECTRIC COMPANY
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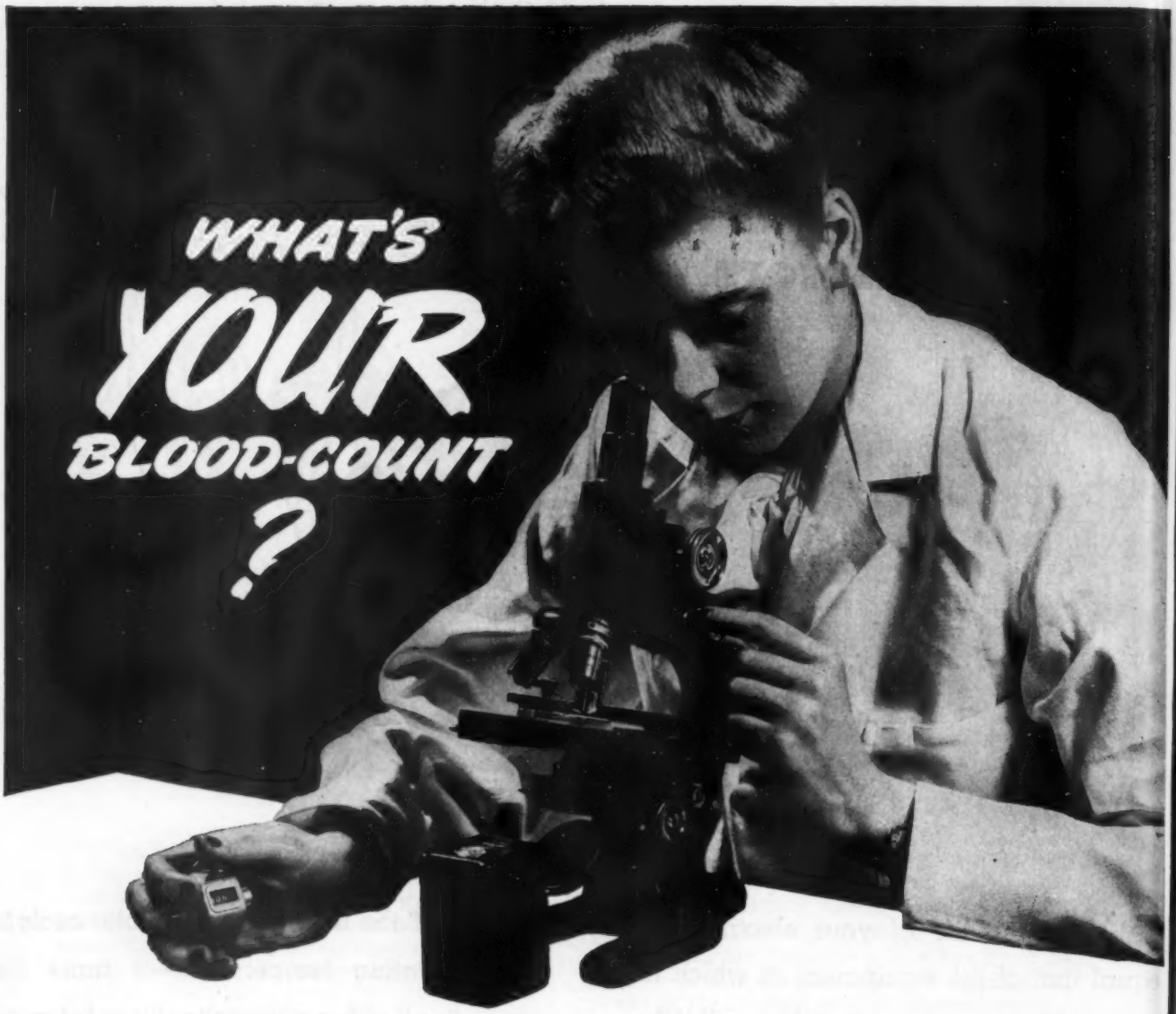
Will the life of your electric motors equal that of the equipment in which they are used? Chances are that they will if these motors are equipped with dependable efficient Klixon Motor Protectors.

Built into the motor by the manufacturer, small, simple, inexpensive Klixon Protectors give motors a helping hand by preventing overheating and burnouts. Every time a busy motor gets over-loaded and dangerously hot—"click" and the protector cuts the motor "off" the line. Once the motor cools to safe operating temperature—it turns the power "on" either automatically or by manual reset depending on the type of protector you specify.

Get the most out of your motors, insist on built-in Klixon Protectors with every motor you buy. They permit maximum operating capacity yet provide complete motor safety. Available for A. C. motors, all sizes; and D. C. motors up to 30 volts.

KLIXON MOTOR PROTECTORS

SPENCER THERMOSTAT CO., ATTLEBORO, MASSACHUSETTS



Ever see a blood-count taken? The hospital laboratory technician carefully takes a drop of blood in a pipette . . . dilutes it with proper fluid . . . and, after shaking, places a drop of this mixture on a special glass slide marked off into 16 equal squares. Then, through a microscope, she begins to count the red corpuscles (or white, or both). And as her trained eye encounters one or the other, she presses the plunger of a compact counting device which she holds in her hand. There is no distraction, no need for pencil-and-paper tally. When she completes the corpuscle-count for one square on the glass slide . . . the total is all ready for her on the face of the Veeder-Root Hand Tally* she is holding. Now she multiplies that total by a given factor . . . and that's your blood-count.

But no matter what your blood-count . . . or your blood-type (determined by another method) . . . you are now eligible as a donor to save the lives of American fighting men. For if you are in reasonably good health, your blood is just as good for plasma as that of a professional athlete. The giving is quick, easy, painless . . . and one of the most needed gifts you can make. So make yourself "blood-kin" to a sailor, soldier, or marine. Make a date to give *your* gift today.

*(*This is one of the hundreds of ways in which Veeder-Root Counting Devices . . . electrically, mechanically and manually operated . . . are used in this world at war . . . They are used to count everything from blood to bullets in a plane's machine guns . . . to the output from machines in war plants.*)

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Among the amazing developments in flight, none has caught greater public fancy than the Jet Propulsion Plane. Previewed here in scale model and realistic background designed by Norman Bel Geddes, an idea is given of how this plane may appear in Tomorrow's skies.

And when the day arrives that public fancy turns to public patronage – it will be because Fafnir, working closely with aircraft manufacturers, has designed and built the precise and practical ball bearing units necessary to the swift jet plane's controls.

Planes, cars, household appliances, machinery – every useful vehicle and device that makes use of rotary power – can be operated friction-free when equipped with Fafnir Ball Bearings. And you can depend on Fafnir for your wants because *the Fafnir line is a complete line – individually applied!* The Fafnir Bearing Co., New Britain, Conn.

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FOR ALL TYPES OF MACHINE TOOLS

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Complete equipment to add a GRAY-MILLS

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to all machines

Equipping tools with a Gray-Mills Coolant System is the simple, economical way to have the advantages of coolants on all machine operations. They can be installed in a matter of minutes for faster production — lower tool cost — longer tool life — and better finish. Gray-Mills offers a complete range of pumps, return pans and fittings for most every machine tool application. Varied capacities in gear and centrifugal pumps assure proper pressure and volume for the requirement.

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FRACTIONAL H. P. PUMPS

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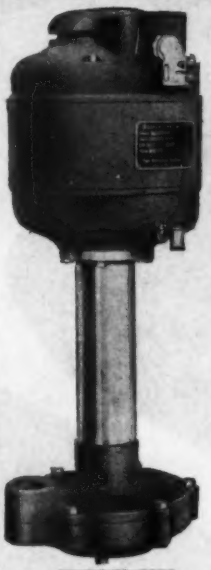
NO *"time out" for* **SHUT DOWNS**



Model TL-7320
See Section 2 of new catalog, indexed for quick reference.

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NO LEAKING

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SCREWS and NUTS
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SPECIAL MACHINE SCREWS and SCREW MACHINE WORK
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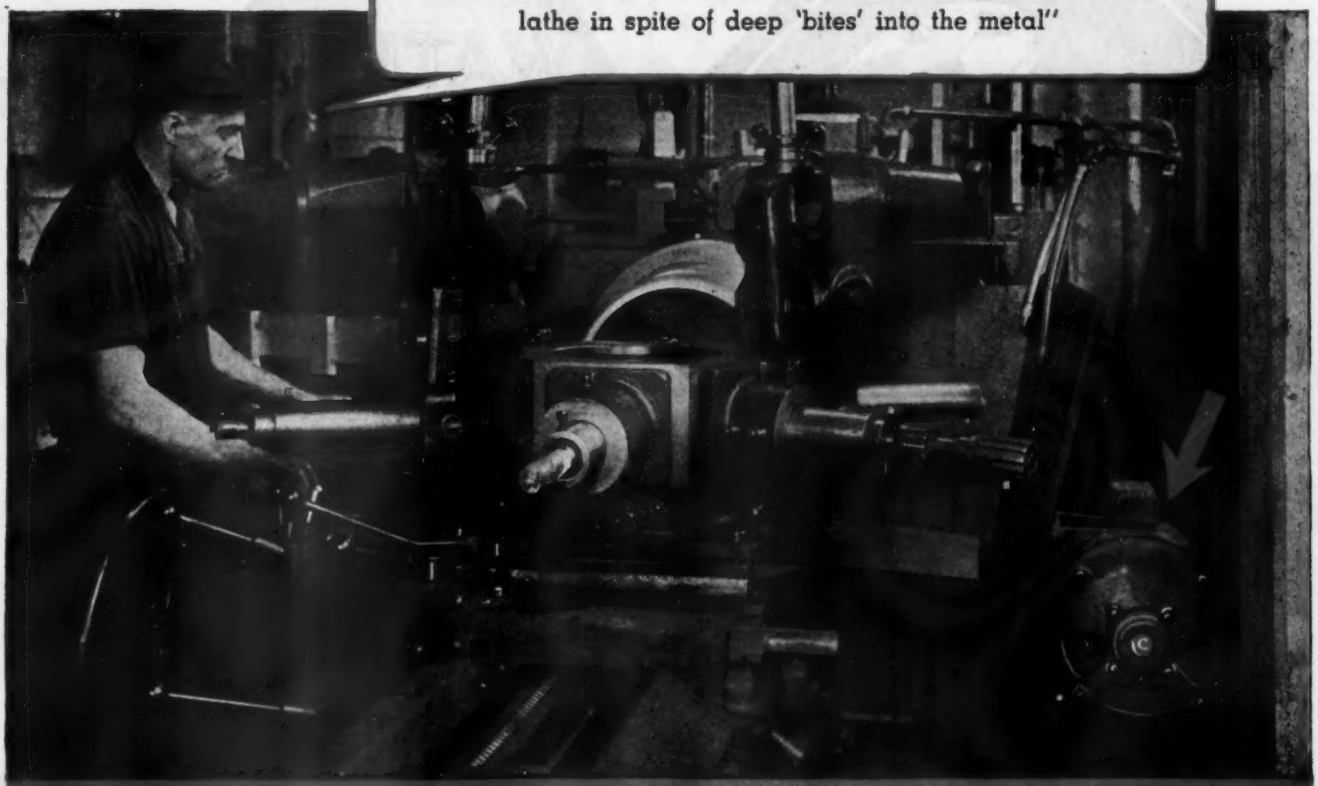
"No grunts and groans from the Century motor on this lathe in spite of deep 'bites' into the metal"



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Provide Extra Protection Against Falling Solids and Dripping Liquids

The Century Form J Squirrel Cage motor is ideal for machine tool applications such as the lathe shown above.

The 10 horsepower Century motor on this job furnishes adequate power for the deep rough cuts and the unusual freedom from vibration also contributes greatly to precision operations, when they are performed.

In addition, this Form J Squirrel Cage motor, which has the upper half of the frame closed, gives protection from the hazards of falling solids and dripping liquids.

Adequate ventilation to compensate for the partial inclosure, is provided by two powerful fans to force a blast of cooling air around the bearings and ventilating passages surrounding the windings.

Get complete information on the advantages of Century Form J motors — and the complete Century line, from 1/6 to 600 horsepower. The wide experience of the Century field engineer may prove valuable to you. He'll be pleased to help you with your problems, whether for today's production or your postwar plans.

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This new, patented diamond tool holder provides a fast, accurate method of meeting every requirement in dressing and truing operations. Equipped with internal coolant ducts for wet grinding, and external cooling fins for dry grinding, metal setting as well as stone are kept at safe operating temperatures, eliminating diamond breakage, due to overheating. Thus, tool life is increased, resulting in savings from 30 to 50% in diamond dressing and truing costs. For finish-dressing SMITITE Diamond Tools are available, in which the stones may be completely consumed without resetting. ***Catalog on request.***

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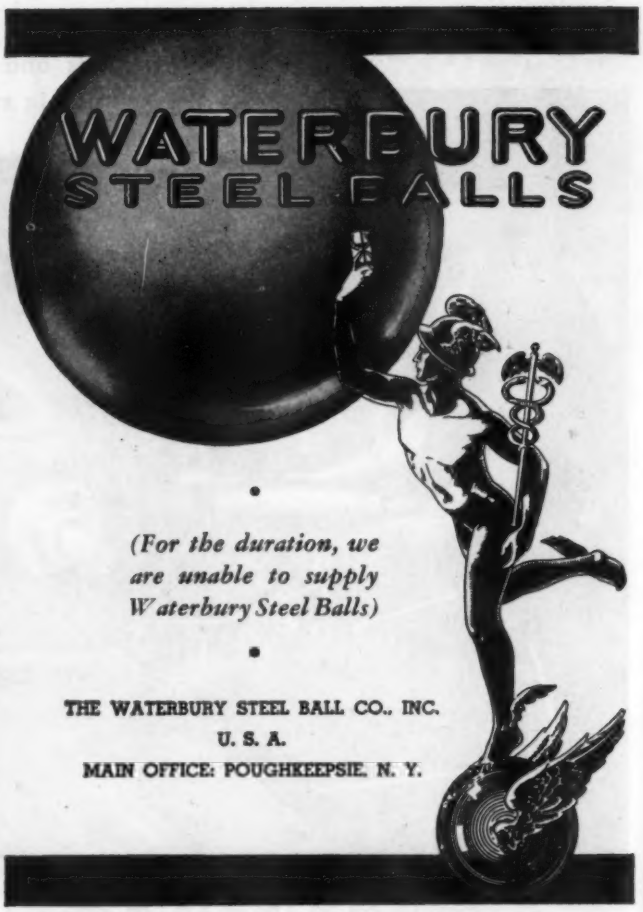

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An important foundry bought a sand muller for mulling facing sand with sea coal. The machine was built to use a worm gear on a speed reducer, but in the interest of economy and in view of extreme dust conditions in the plant, the engineer hesitated to install this type of drive. He called in the Dayton V-Belt Distributor for a consultation.

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The Dayton Distributor weighed all factors and recommended installation of a Dayton V-Belt Drive — 8 V-Belts, 5" Drive Pulley, 48" Driven Pulley, 66" center to center distance. The Dayton V-Belt Drive has now been performing for nearly four years without requiring a single hour's maintenance time. And the saving over the cost of the other drive amounted to several hundred dollars.

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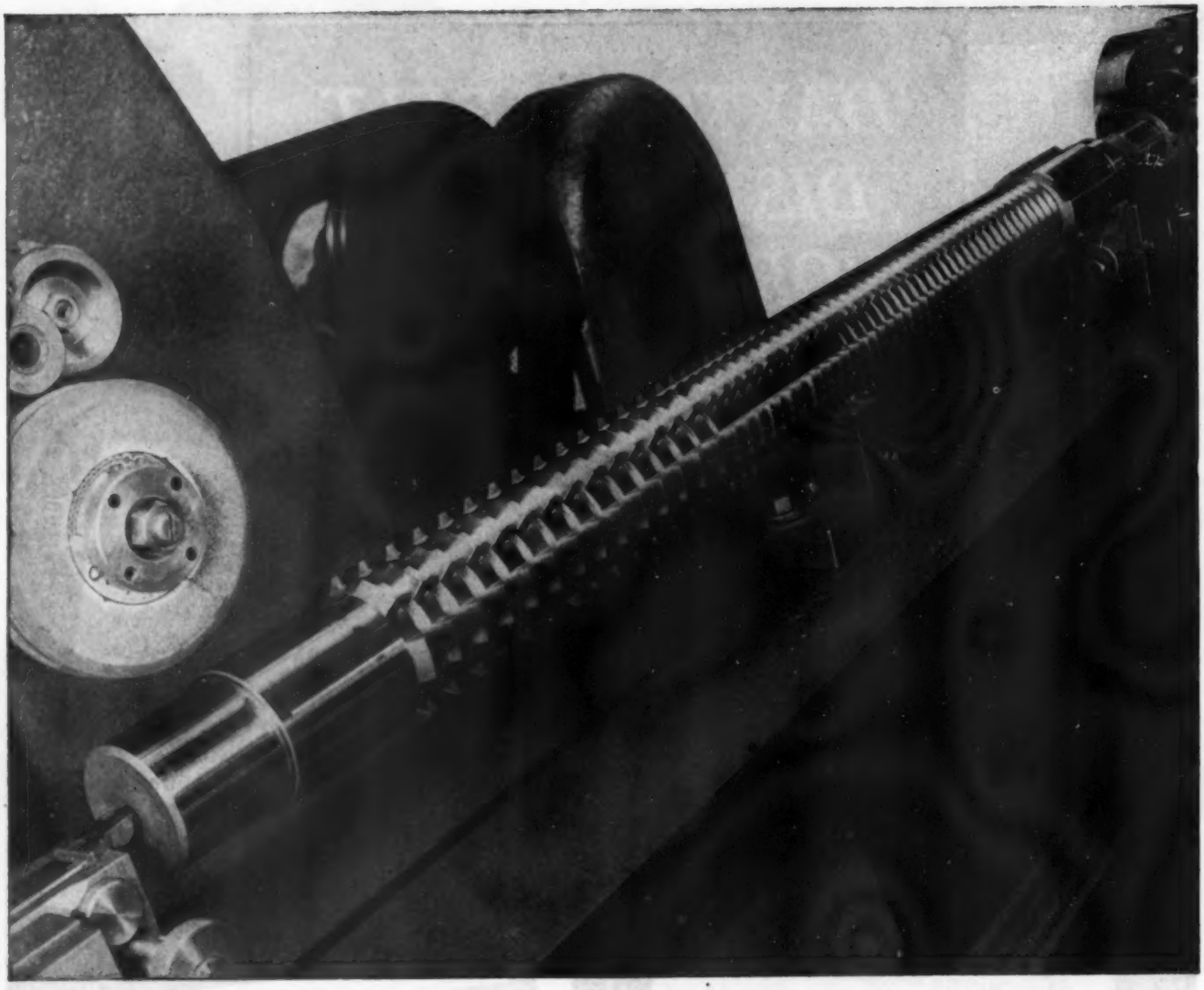

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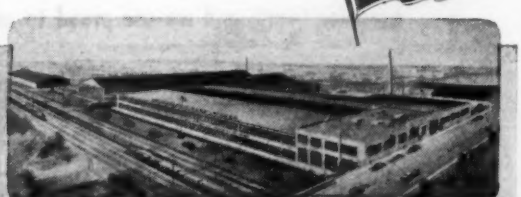

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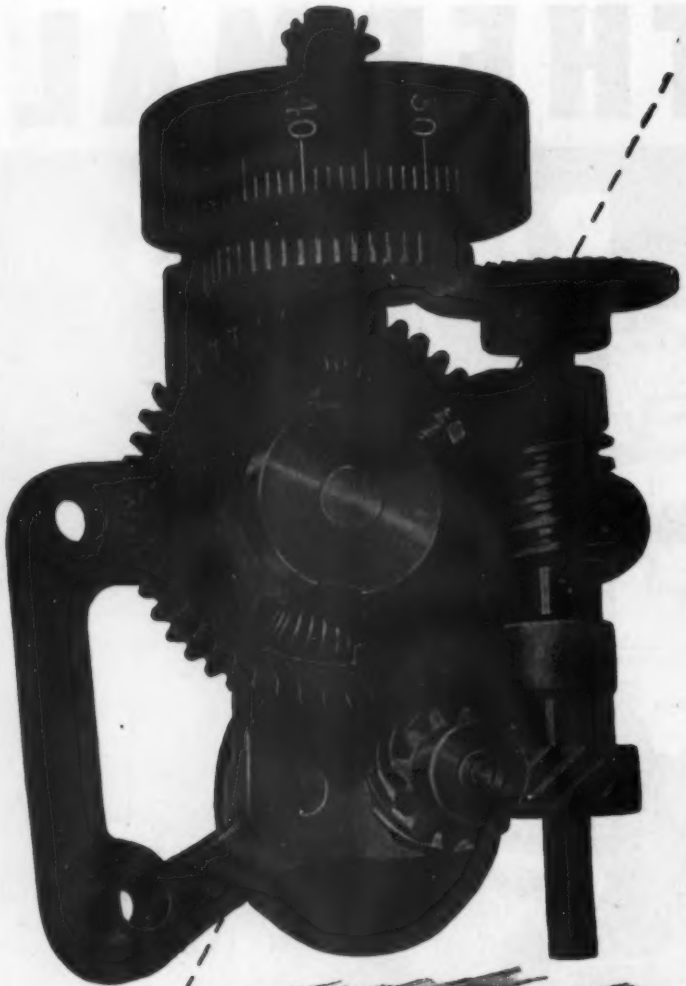

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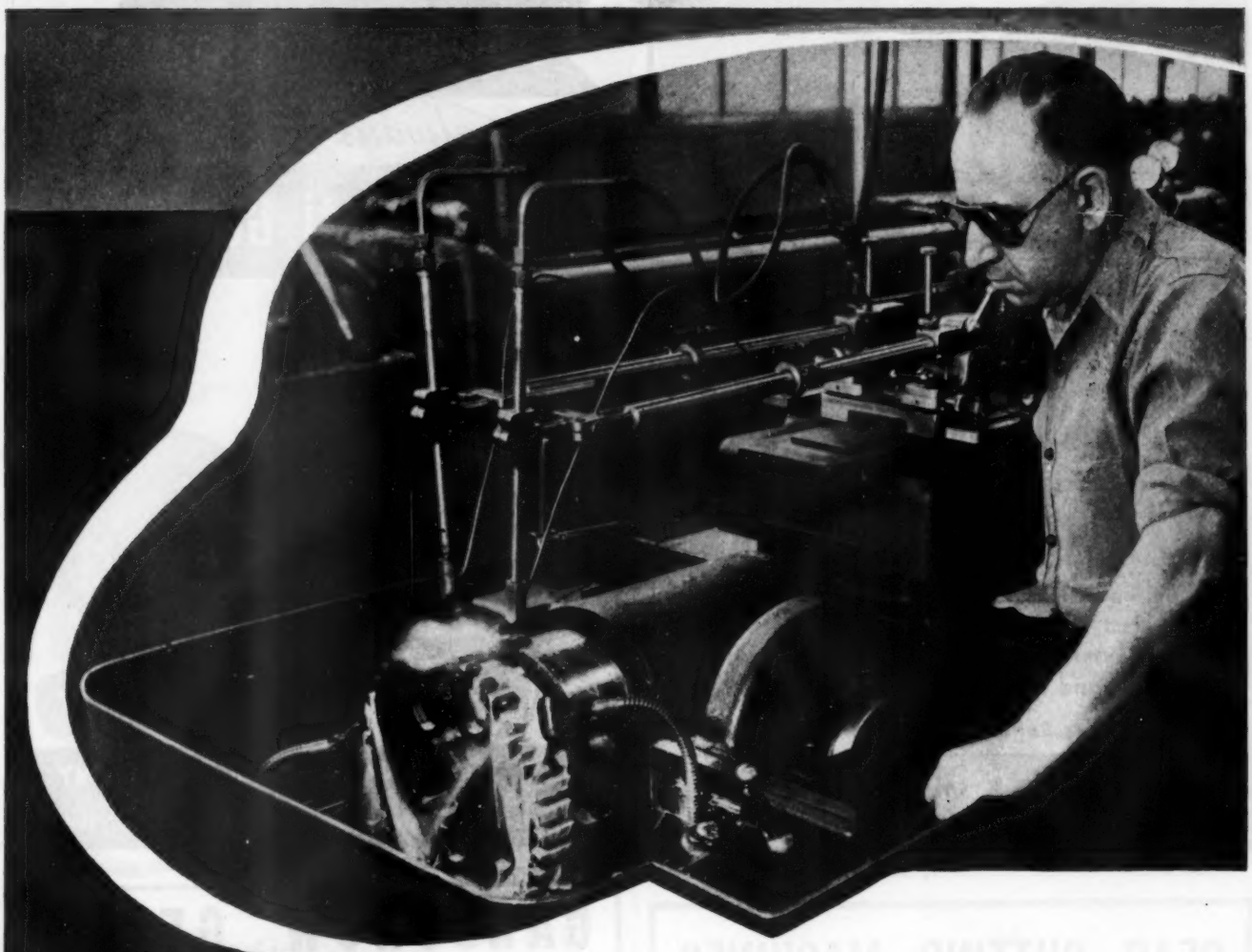

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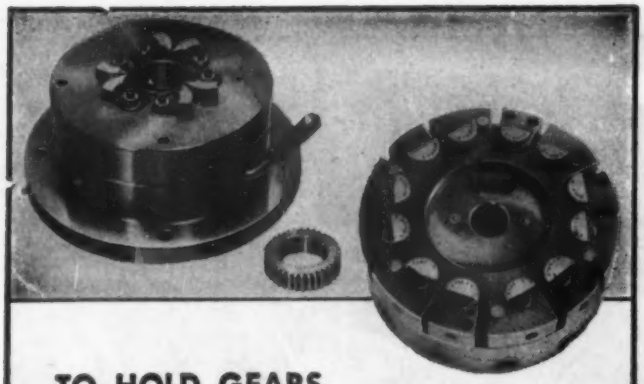

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Principle used only in

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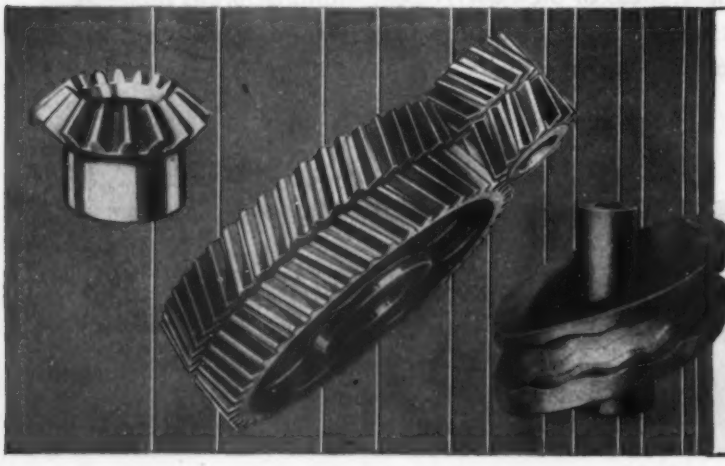

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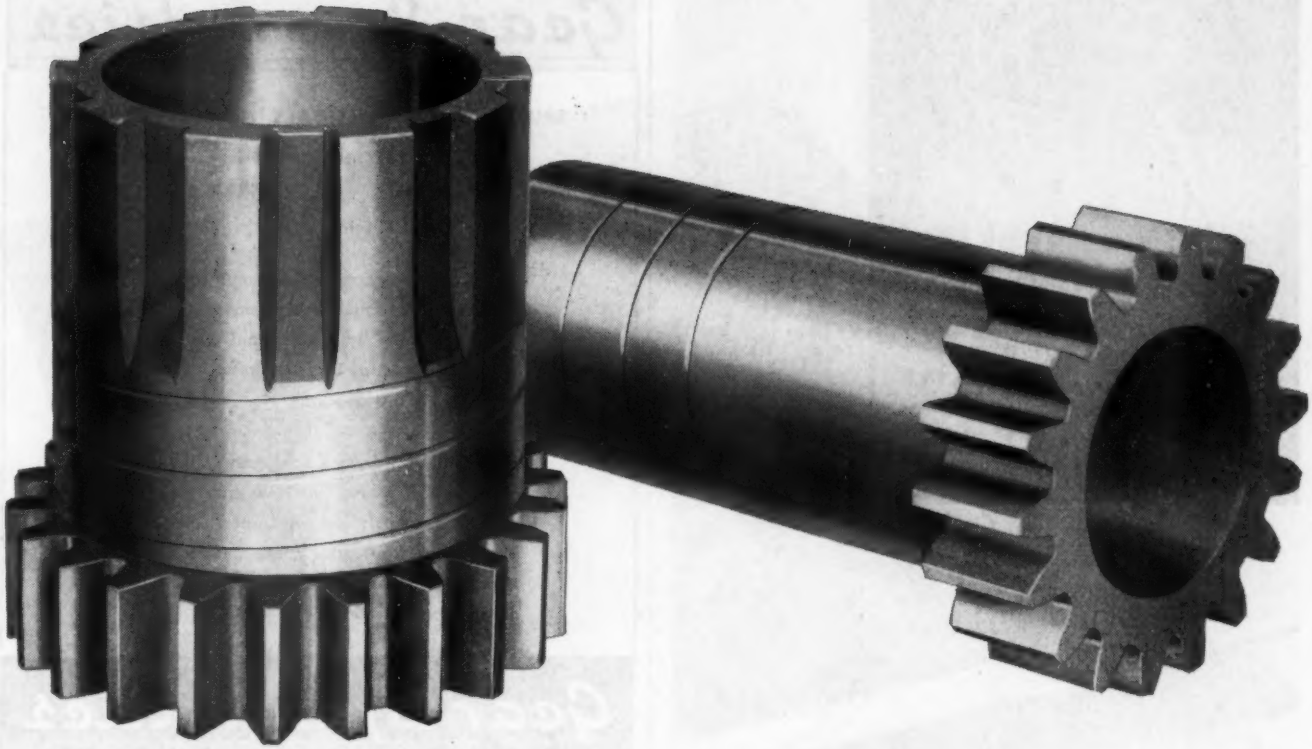

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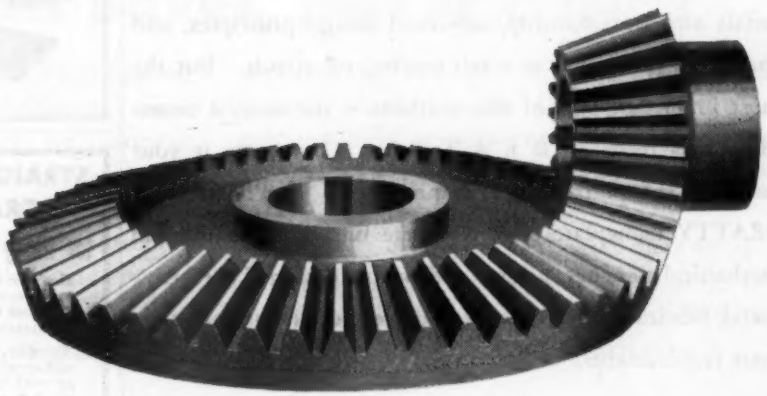
Adams Gears are produced with the finest production and inspection equipment obtainable and they can be furnished to your most exacting requirements.



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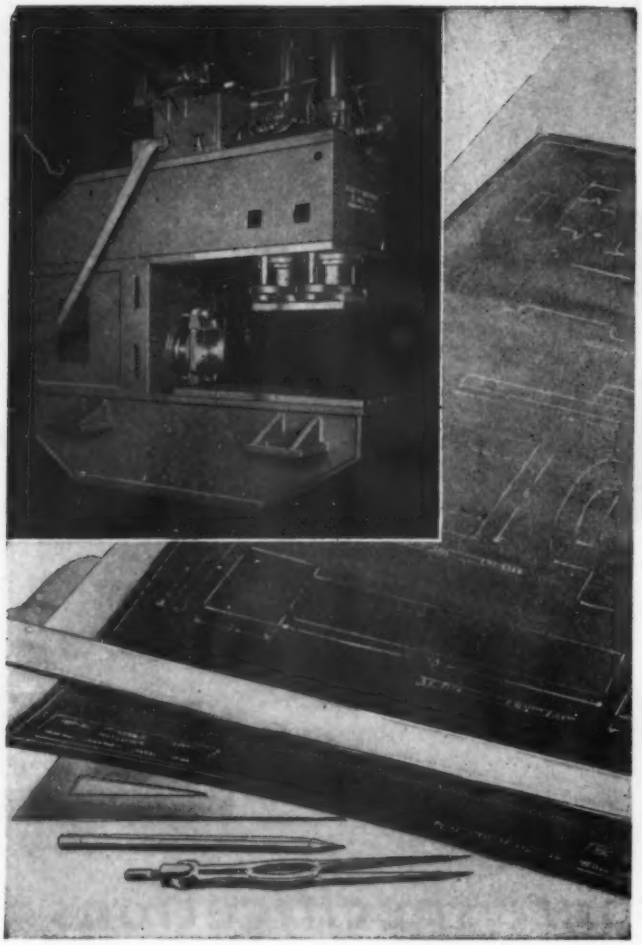

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This is the Beatty 400-ton Hydraulic Forming and Flanging Press. Specifications call for finest quality materials and workmanship, advanced design principles, and special features such as a self-cooling oil circuit. But the most important part of this machine is the modest nameplate that reads — B E A T T Y. That name is your assurance of performance as promised. You'll find the BEATTY nameplate on a complete line of hydraulic and mechanical punches, presses and shears, designed for heavy metal fabrication. Write us for complete information on your requirements.

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WORM GEARING • THREAD GRINDING
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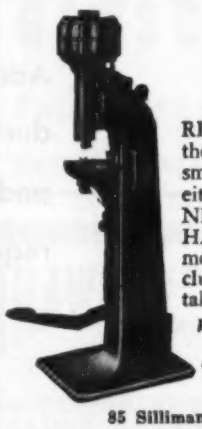

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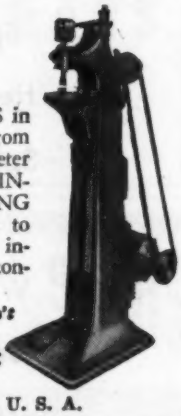
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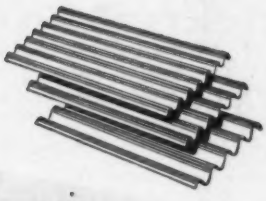

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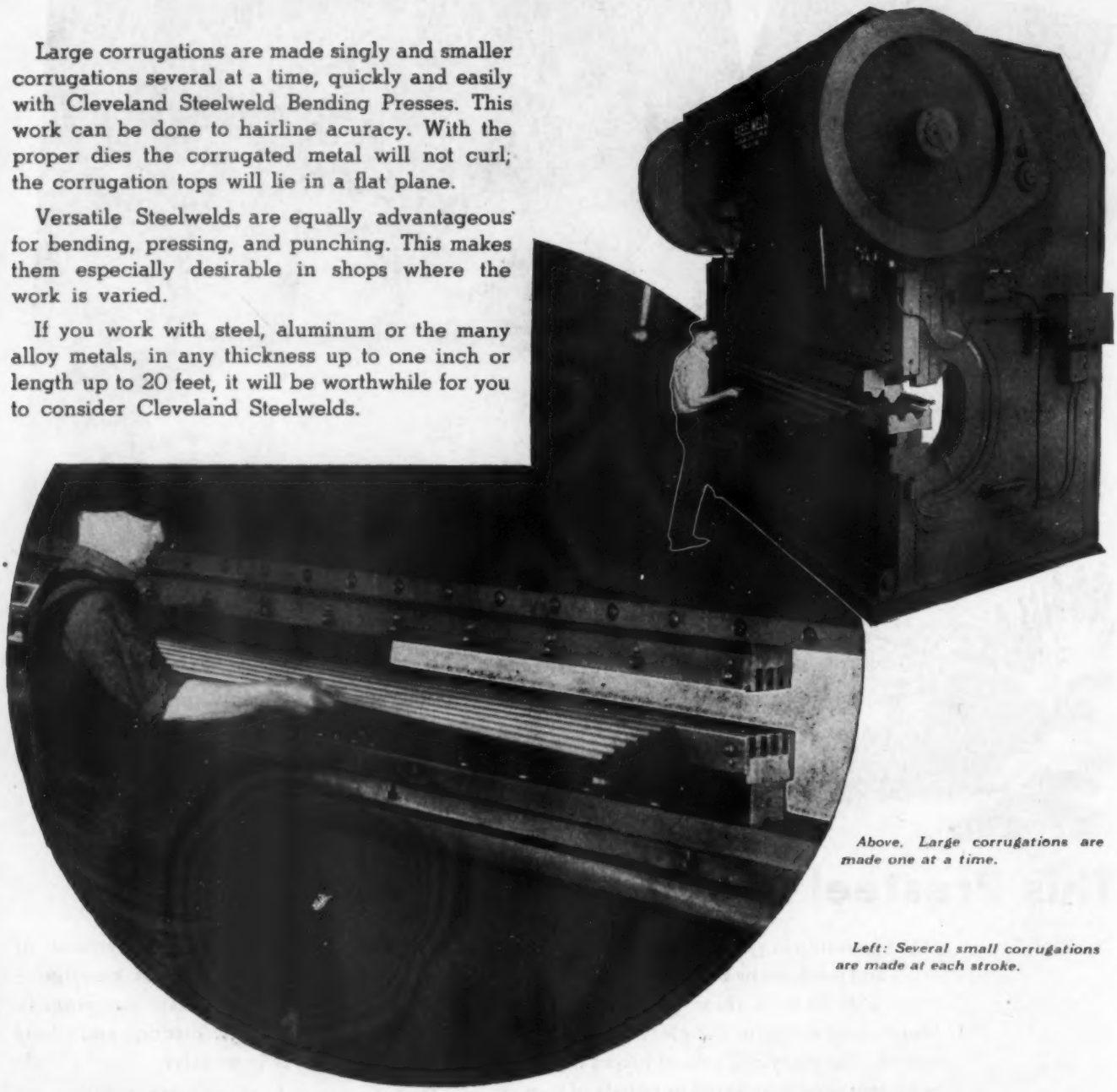

Above. Large corrugations are made one at a time.

Left: Several small corrugations are made at each stroke.

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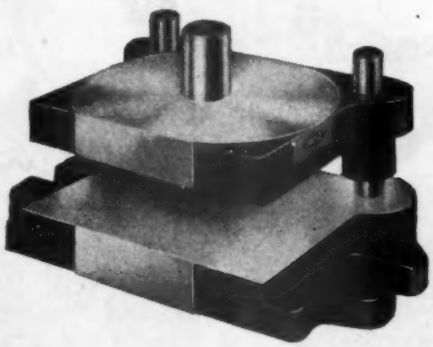

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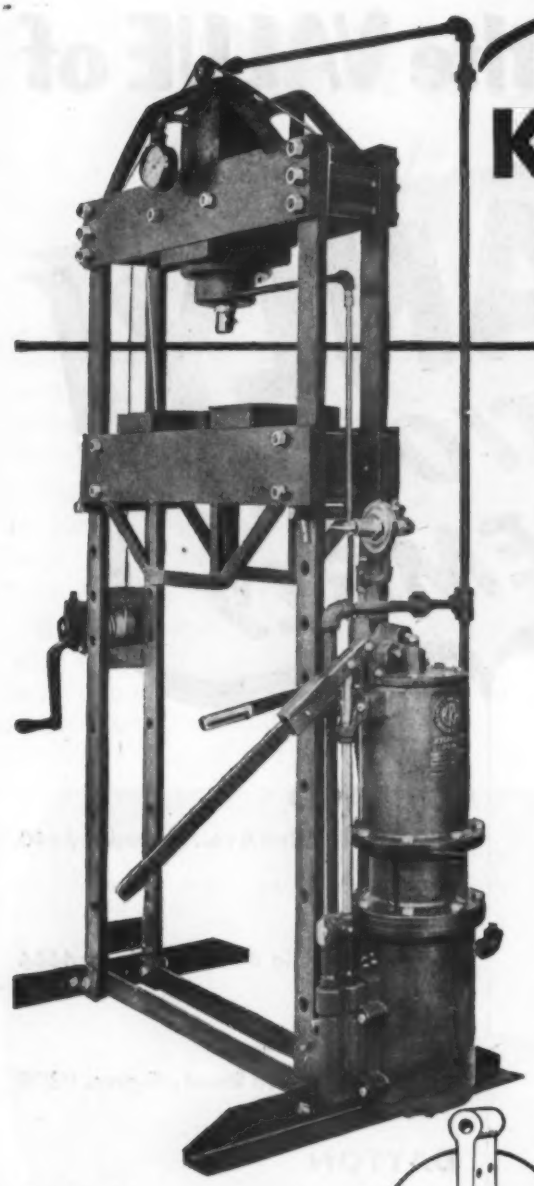

The KRW HYDRAULIC Efficient

EQUIPPED WITH PATENTED KRW SPEEDI-BOOSTER AND USING LOW-COST DIES, IT DOES THE WORK OF EXPENSIVE PRESSES AND BENDING MACHINES ON SHORT-RUN PRODUCTION

If you could see some of the manufacturing uses to which KRW Hydraulic Presses are being put today, you'd doubt your eyes. Nevertheless, the versatility and adaptability of these air-operated presses is being profitably proven today by many factory and production executives. Heart of the New KRW Speedi-Booster Hydraulic Press is its sensitive finger-tip control mechanism which instantly governs ram movement—lower, raise or stop. With a few simple and inexpensive dies these KRW Presses can be adapted to a wide variety of bending and pressing operations requiring pressures from 5 to 75 tons. Air pressure varying from 80 to 225 pounds is required—resulting hydraulic pressure varies with air pressure used. Built-in air regulator permits exact duplication of pressure at each stroke . . . important in many types of fast production. Available for either vertical or horizontal operation. Quick delivery on all sizes. Write for KRW Hydraulic Press Bulletin. Our Engineers are at your service. We also manufacture suitable capacity air compressors. K. R. Wilson, 10 Lock St., Buffalo 2, New York.

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With the simple dies shown, quickly made from stock steel, this 6-inch ring is made with but four feeding passes into the lower die. Before the radius is completed, the shackle is inserted into the die notch, permitting the ring to "thread the eye" of the shackle. Closing ring by welding completes operation. EQUIPMENT: 25-ton KRW Press.

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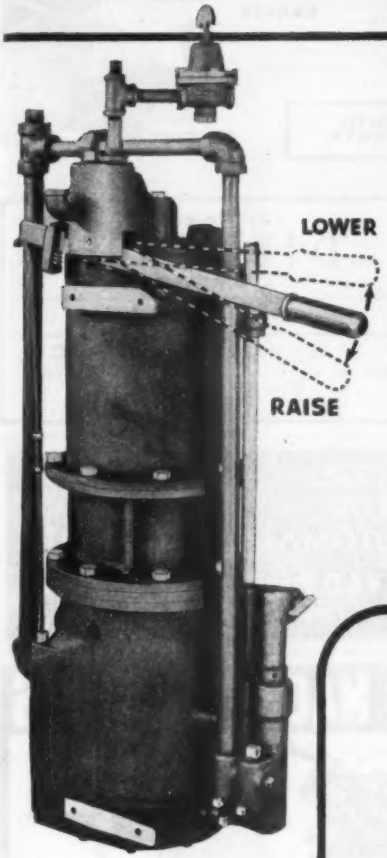
ARBOR PRESS IS AN PRODUCTION MACHINE



THE KRW SPEEDI-BOOSTER WITH FINGER-TIP CONTROL Instead of capstan wheel or pumping lever, the KRW Speedi-Booster utilizes compressed air as the motive power operating the ram. Because the compressed air is controllable through a pressure regulator, any desired tonnage pressure at the ram can be obtained and duplicated. Ram movement (up, down or stop) is controlled with the slightest finger-tip movement of the lever. Thus worker fatigue is greatly reduced, full and instant control obtained.

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This special crank handle — required in small lots—is completely shaped in two operations on the same press with the aid of low-cost V-shaped die and matching ram head. To conserve space, a horizontally-operating press is used for this and other small work. The low cost dies were made from available pieces of scrap steel welded and machined.

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25-50-60 TON PRESSES

AIR PRESSURE	7" AIR CYLINDER		9" AIR CYLINDER	
100 TO 200 POUNDS	2" Oil Cylinder	1¾" Oil Cylinder	2" Oil Cylinder	1¾" Oil Cylinder
	10 to 22 Tons	14 to 29 Tons	17 to 35 Tons	23 to 47 Tons

75 TON PRESS

AIR PRESSURE	9" AIR CYLINDER	
100 TO 200 POUNDS	2" Oil Cylinder	1¾" Oil Cylinder
	25 to 51 Tons	33 to 68 Tons

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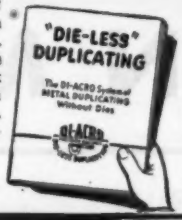
If you desire to save time and critical materials on production of metal stampings or other small parts, then the DI-ACRO System of "Metal Duplicating Without Dies" merits your consideration. It is based on the rapid and accurate production of formed parts with DI-ACRO Shears, Brakes and Benders. All duplicated work is accurate to .001". These precision machines are adaptable to an endless variety of work, and ideally suited for use by girl operators. For short runs your parts are processed in a matter of hours instead of waiting weeks for dies.



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It illustrates many stampings or parts made without dies, gives full details on DI-ACRO machines and shows how they may readily be adapted for various applications. Request your copy now.

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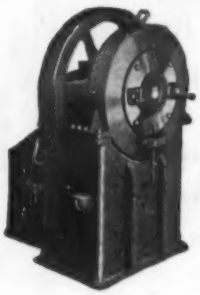

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— with 4000 forceful squeezing hammer blows per minute—makes metal tougher and more elastic. Send for booklet—"The Torrington Swaging Machine."

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AT LOWER COST
46 Styles—195,000 Sizes
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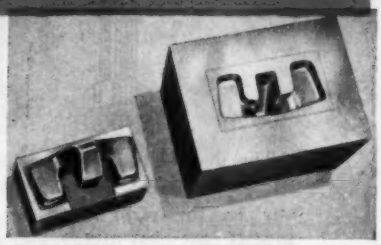
Where Quality Production calls for SENSITIVE CONTROL

Elmes 3000-Ton Hobbing Press at Midland Die & Engraving Company. Bullet-proof glass shutter and metal side shields protect operator. Micrometer depth gage indicates slide movement. A compact machine, ruggedly built and thoroughly dependable.



Typical of Midland's ability to do the unusual is this mold for a die-cast lock strike. Note the difficult angles of the hob (left), and the perfect impression in reverse in the accurate, completed hobbed cavity.

"We must have accuracy, and we get it from our Elmes," says Mr. A. J. (Art) Bachner, Midland's president and guiding spirit. "That's why our new 1000-ton press is going to be an Elmes, too."

In five short years, Midland Die & Engraving Company of Chicago has earned a national reputation for precision work on intricate hobbed cavities for plastics molding and die casting—work that demands experience, skill, and utmost accuracy in equipment at every stage of production.

From the start, Midland hobbed cavities have been sunk on a 3000-ton Elmes hydraulic hobbing press, a machine so easy to operate, so instantly and unfailingly responsive to control, that operator Jackson manipulates this titanic 6,000,000-pound force with amazing dexterity and speed. Sinking a hardened steel hob into a blank of cold steel is a matter that calls for good judgment and implicit confidence in the ability and performance of the press, if hobbed cavities are to measure up to Midland's high standards.

"We think a lot of our Elmes," says Supt. Nels Rundgren. "There's been no trouble of any kind and the slide packings have been renewed only once." To which President A. J. Bachner adds: "I've seen them all. Elmes is the press for us. It has been a very important element in our success."

Elmes presses for compression or transfer molding of plastics, and for all types of metal working — straightening, drawing, forming, forcing—are backed by nearly a century of progress in hydraulic equipment. Elmes engineers can serve you as they have hundreds of others. Send for Bulletin No. 5000, "Hydraulic Plastic Molding Presses," or for literature on pumps, accumulators or any type of metal working press you need. Recommendations and estimates are yours for the asking.

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ELMES HYDRAULIC EQUIPMENT

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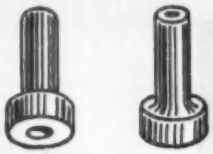
Time Saving and Cost Cutting IN ONE EASY LESSON

Here are two tubular parts, exactly alike . . .



The one on the left was bored out of a solid bar of tool steel, and cost $28.40 to make. The one on the right was sawed from a bar of **BISCO** tool steel tubing, and cost only $9.10.

The difference is represented by a pile of scrap. . . .

which cost $19.30 to produce! It also cost the manufacturer precious hours of man-time and machine-time which he could have used more profitably.

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Let's saw instead of boring!

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TUBE CUTOFF MACHINE

- **Completely automatic**
- **Hydraulic finger-tip control**
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- **Entirely self-contained**
- **Easily operated — no experience needed**
- **Dial-controlled feed and speed adjustment**

● The new ETNA Tube Cutoff Machines are entirely self-contained units. Drive motor, hydraulic pump and motor, hydraulic cylinders . . . all moving parts . . . are mounted within the safe base with rotating cutter head. Tubes are held stationary while being cut. The spindle, on which the tool holders are fastened, is mounted on Timken tapered roller bearings and is V-belt driven by a Louis-Allis "Adjusto Speed" Motor. Machines are built in capacities to cut tube ranging from 1/2" O.D., 1/8" Wall up to 12" O.D., 1 1/2" Wall. Units to handle tube of over 5" O.D., 1/2" Wall are built to your order.

Write for full details on the new ETNA Tube Cutoff Machine! Complete operating and construction data will be sent at your request.

Machine with cover removed, showing tube in position to be cut off.

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The Bodine is a "process" rather than an "operational" machine tool . . . it moves the work through several different operations, automatically. This principle helps manufacturers to reduce costs . . . the idea behind all Bodine designing . . . a necessity if war-plants are to regain their pre-war markets.

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The basic principle of Bodine machines combines an automatic horizontal indexing table with 6 to 8 spindles, located at will and tooled to perform operations in sequence as the parts move to working stations. The operator merely places the part in a clamping fixture . . . removes it when the cycle is completed. Often ejection is automatic . . . sometimes hopper feed is practical. In any event, operators are quickly taught to attain, and maintain, high speed production. Extreme accuracy is inherent in the machine itself.

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If you are not a Bodine machine owner . . . send for Bulletin . . . ask for full information.

Production requirements in this critical war year are shifting men from non-essential to essential work. Most of them are not mechanically minded. Disabled veterans can readily operate Bodine machines.

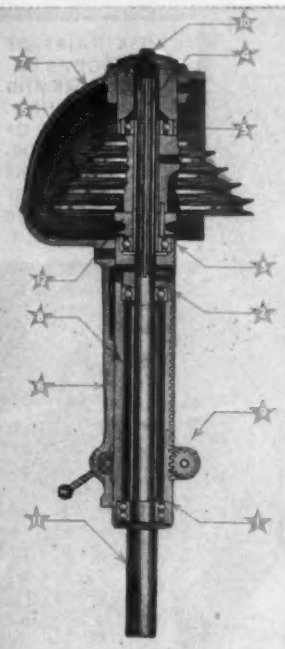
It is the responsibility of war plant management to make them productive employees as quickly as possible . . . so we suggest that you train new men (and women) to operate the Bodine machines you now have. This procedure may permit advancement of your older, more experienced operators to more difficult jobs . . . for improved all-around production.

Bodine operators clearly see how well they fit into hi-speed war production . . . are contented with their effort to help win the victory . . . and the low fatigue factor and clean, healthy work are major contributions to the defeat of absenteeism.

6 STANDARD SIZES

The six standard Bodine machines range from the No. 40-10 to the larger No. 48-30 and require floor space from 54"x60" to 90"x96". They accommodate from 6 to 8 spindles . . . can be adapted for a great variety of tooling set-ups. (No. 48-30 shown processing armament components.)

Why Industry Prefers THE WALKER-TURNER 20" DRILL PRESS!



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11. No. 2 Morse Taper Spindle Nose.
12. Power feed take-off pulley. Feed coordinated with spindle speed.

The sectional view above illustrates the careful design that provides an unusually smooth-running spindle in Walker-Turner 20" Drill Presses. These rugged production machine tools are in use in great numbers in war industries today. Due to their versatility, many have been applied in special tooling set-ups of various kinds. Simplicity of controls permits their use by unskilled and semi-skilled labor — an important point under present conditions as well as in the post-war period.

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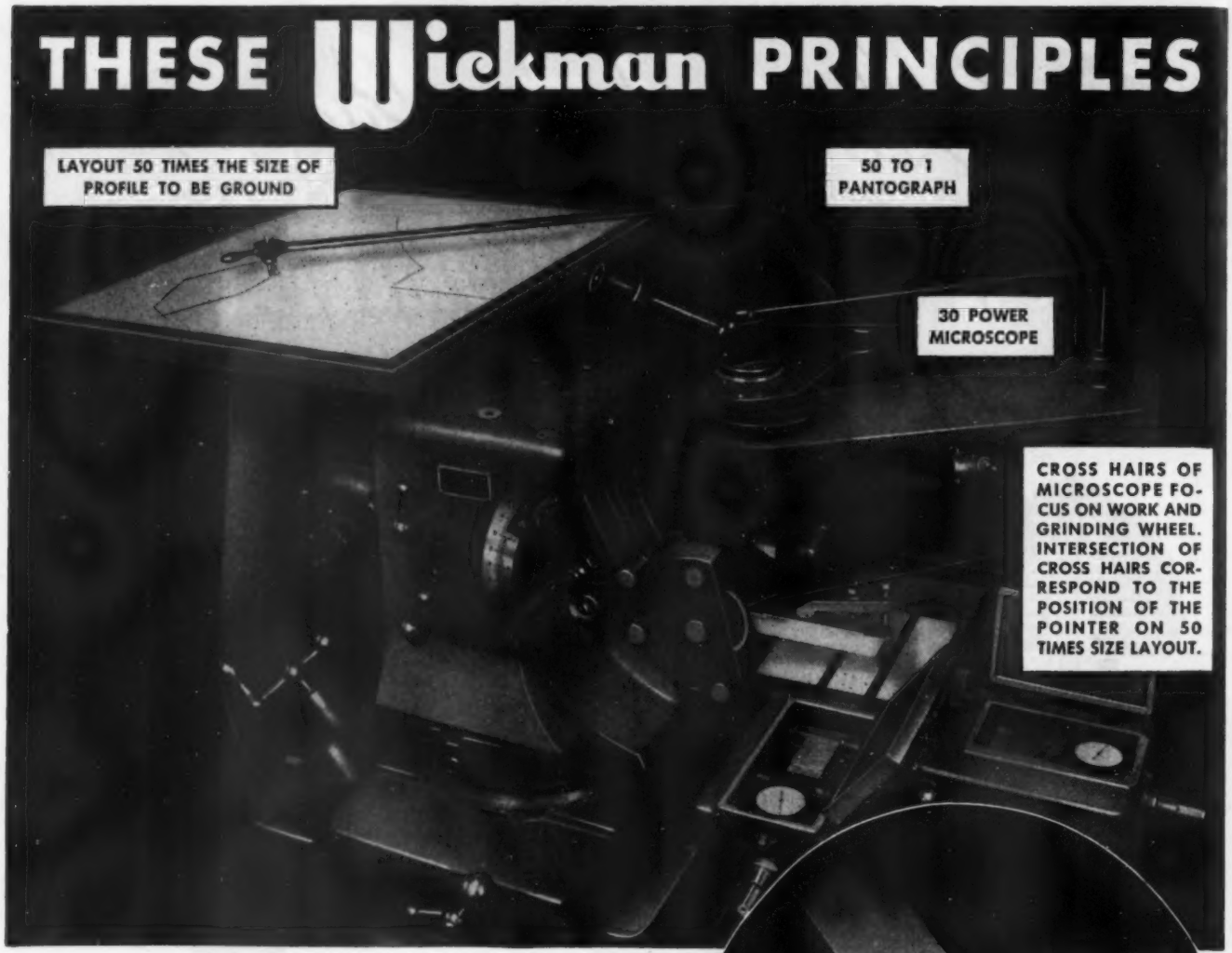
THESE Wickman PRINCIPLES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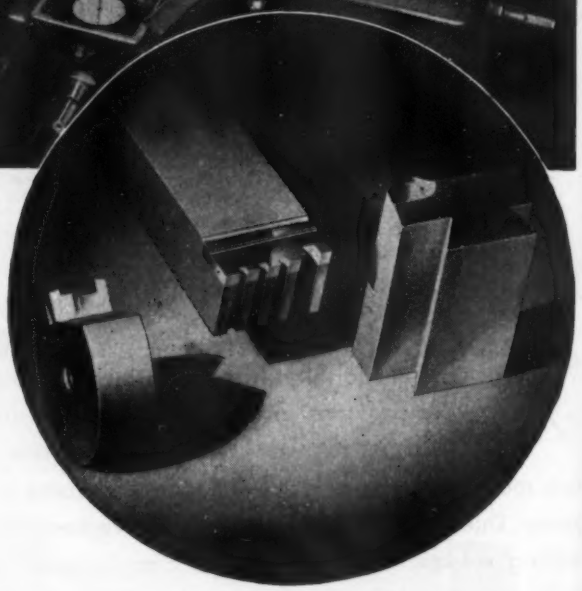
50 TO 1 PANTOGRAPH
30 POWER MICROSCOPE
CROSS HAIRS OF MICROSCOPE FOCUS ON WORK AND GRINDING WHEEL. INTERSECTION OF CROSS HAIRS CORRESPOND TO THE POSITION OF THE POINTER ON 50 TIMES SIZE LAYOUT.

Make Possible The ACCURATE GRINDING Of Profiles Such As These In Tungsten-Carbide Or Other Hard Metals



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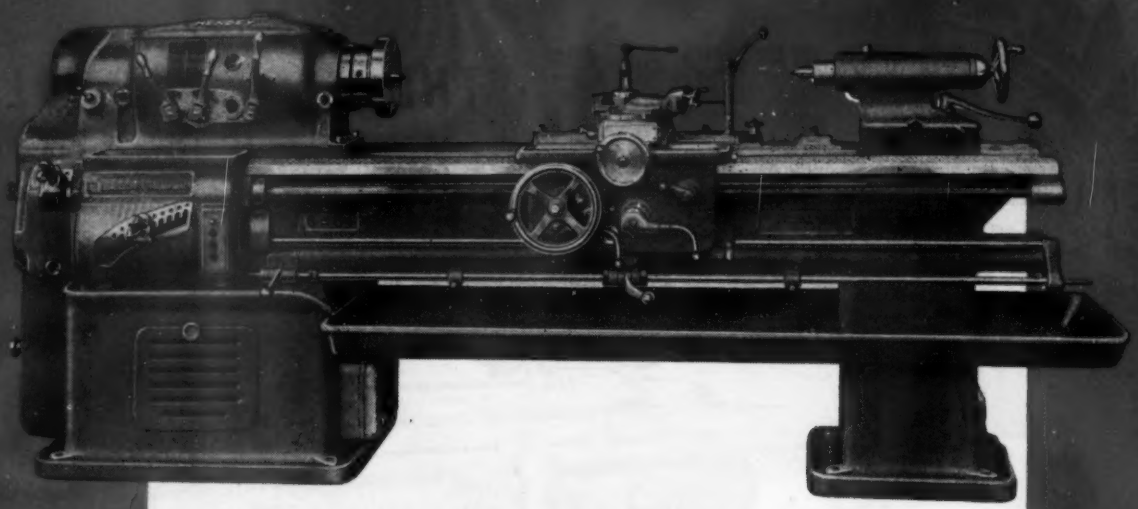

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Machine Tools are and always will be Basic Master Tools of Industry. Without them our country would have been unable to produce the vast stores of war materiel which are rocking the Axis nations back on their heels. In this war job Hendey Lathes and Shapers have not been found wanting.

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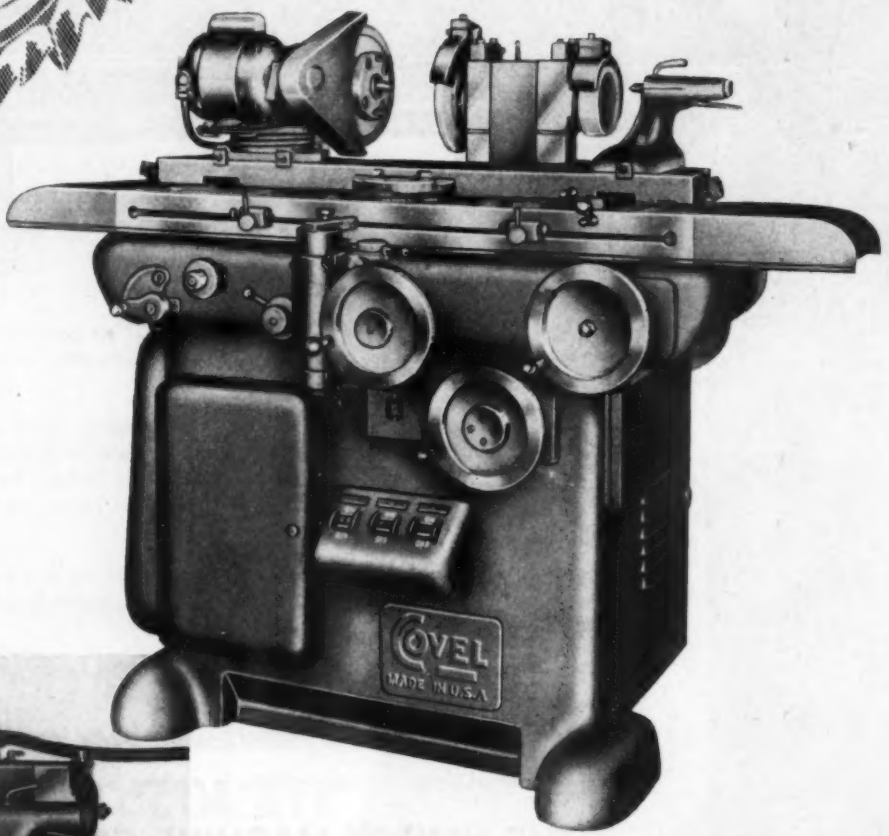
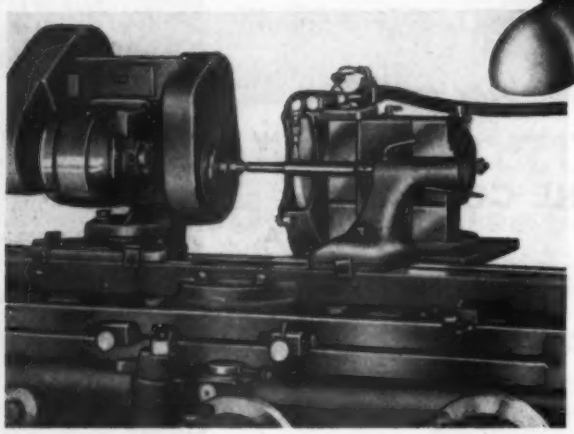
Boston **New York** **Rochester** **Detroit** **Chicago**

DOUBLE THE PROFITABLE LIFE Of Your CUTTERS and TOOLS





Set-up for wet dead center cylindrical grinding, using three speed motor-driven headstock. (Splash guards removed.) Set-ups like this are made quickly and easily on the No. 22—giving "UNIVERSAL" a practical meaning.

Grind Them On The COVEL No. 22

Over-worked cutters and tools take a new lease on life, after conditioning on the No. 22 Universal Cutter and Tool Grinder. No matter what the job, No. 22 can be set up quickly and accurately through controls that move by a feather touch, but lock rigidly in place until the work is done. This operating ease means increased output, too, a vital factor in keeping a steady flow of tools going to the production line. And the rugged, precise COVEL construction is assurance of constant accuracy.

For complete information about the No. 22 and its many new features, write today for your copy of Bulletin **A-154.**

PROMPT DELIVERY ASSURED ON COVEL No. 22

GRINDING MACHINERY SINCE 1874

COVEL INDUSTRIAL GRINDERS

COVEL MFG. CO., BENTON HARBOR, MICHIGAN U. S. A.

On a GORTON 16-A

GRINDING DOWN TIME: 0

GREATER ACCURACY IMPROVED FINISH

THE SMOOTH-RUNNING VIBRATION-FREE PERFORMANCE of the Gorton 16-A Precision Automatic Screw Machine completely eliminated down time for grinding tool bits on this typical production job detailed at right. Turning, drilling, reaming and chamfering of 26,000 parts, with tolerances held within .001" on all dimensions, was completed with ONE grinding of tools.

Higher accuracy was maintained consistently over the entire run than was possible by previous methods. In addition, an improved finish was obtained.

Wide Range of Work

The Gorton 16-A produces an almost endless variety of short or long, slender parts — diameters .005" to 7/16", lengths 1/32" to 2¾"—complete in one operation.

It does step turning, generates curves, tapers, back recesses, knurls, chamfers, etc. It centers, drills, slots, threads or taps.

Tool slides are easily accessible. Micrometer adjustments for all tools insure accurate, quick setups at low cost. Centralized fingertip controls provide infinitely variable spindle speeds (1100 to 10,000 R.P.M.) and infinitely variable cam feeds (20 to 720 pieces per hour; 20 to 1440 optional). No speed or feed gears to change.

GORTON Complete Cam and Tool Service

For Any Make Swiss-Type Screw Machine—Gorton or Others

Gorton exclusively offers a complete cam and tool service. Highly skilled engineers are available to take care of all your needs. This service consists of a detailed cam and tool layout, listing all operations of the machining cycle together with necessary cams, tools, collets and bushings. This service is available at the Gorton factory at Racine, Wis., for the Midwest and Pacific areas; and from Russell, Holbrook, and Henderson (our Eastern Distributors) of New York City for quick service in the East.

ON 26,000 PARTS LIKE THIS

How This Job Was Done

Tools—Standard, single-point cutters.
Special Attachments—Gorton 3-spindle drilling attachment equipped with .230" drill and .252" drill.

OPERATIONS

1—Spot center and turn .3125" dia. 3/16" long.
2—Drill .230" dia. and counterbore .252" dia. 3/32" long.
3—Chamfer all corners. Ream.
4—Cut off finished part.

Material—Mild steel bar stock 7/16" dia.
Production—70 pieces per hour.
Tolerances—.001" on all dimensions.

These other typical parts shown actual size

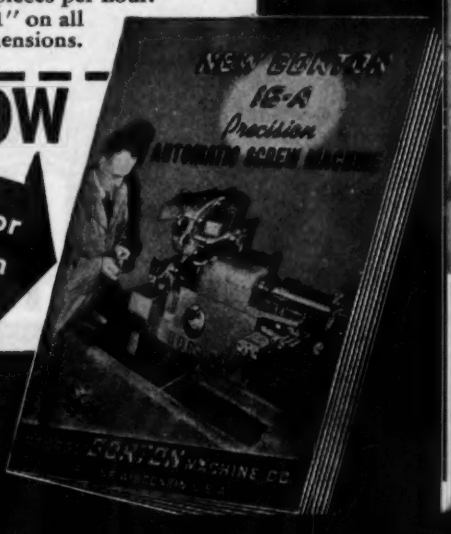
GET THE FACTS NOW

Mail Today for FREE Bulletin

GEORGE GORTON MACHINE CO.
1507-20 Racine St., Racine, Wis.

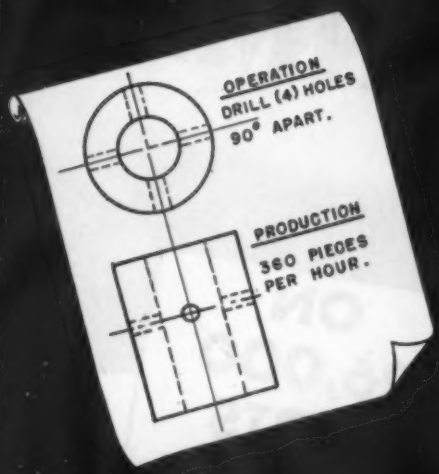
Send me, without obligation, FREE bulletin with complete information covering the Gorton 16-A Precision Automatic Screw Machine.

Name..... *Title*.....
Company.....
Address.....
City..... *State*.....



GEORGE GORTON MACHINE CO.
1507-20 RACINE STREET, RACINE, WISCONSIN, U. S. A.
SPECIALISTS FOR 50 YEARS IN TRACER CONTROLLED MACHINES—ENGRAVING, DIE MAKING, VERTICAL MILLING MACHINES

Avey Automatic
METHOD No. 2



THE Avey CAM FEED UNIT

No. 1 Size—½" capacity in cast iron.
No. 2 Size—⅜" capacity in cast iron.

designed for multiple directional drilling, reaming, boring or tapping (high production) at one stationary clamping of work

THE AVEY DRILLING MACHINE CO.
CINCINNATI • OHIO • U. S. A.

The AVEY Cam Feed Unit (Avey Automatic Method No. 2) — high production at low labor cost — The enabling of semi-skilled operators to deliver High Quality Production: Speedily, Accurately, Efficiently, and with a minimum of supervision.

ARMY E NAVY

Avey DRILLING MACHINES
CINCINNATI • OHIO

PLAN-O-MILLING

"FIRSTS" WITH PLAN-O-MILL

- 1st to install General Electric's remarkable new Thy-mo-trol electronic feed control!
- 1st planetary to mill external threads with standard multiple thread cutter!
- 1st planetary to coordinate feeds and speeds!
- 1st to provide absolute control of feed-in!

FAST, ACCURATE MILLING OF CYLINDRICAL FORMS

You get the speed and high production of special purpose equipment when you replace wasteful, obsolete machines with Plan-O-Mill.

Yet Plan-O-Mill is flexible. A slight tooling change adapts it to a wide variety of thread milling and form milling jobs.

Plan-O-Mill saves manpower too! It is semi-automatic, can be operated by semi-skilled or unskilled labor. One man or woman can operate two or more Plan-O-Mills.

Find out about Plan-O-Mill today! Contact your machinery supplier or write direct.

PLAN-O-MILL
CORPORATION
1511 East Eight Mile Road · Hazel Park, Michigan

The Sunnen Precision Honing Machine
– with New Coolant Pump and Base –

Provides GREATER HONING SPEED and ACCURACY

With the addition of a new base that contains a pump for supplying honing fluid, the Sunnen Precision Honing Machine is setting new standards of accuracy. Honing is faster, too. The honing fluid carries away all cuttings, keeps the abrasive stone sharp, and cools the part being honed.

With the Sunnen Precision Honing Machine, accuracy is guaranteed to be within .0001"— and has been held to .000025". A super-smooth finish can be produced. On certain types of metal, a finish of 2 to 3 micro inches can be obtained.

- **Hones and finishes cylinders from .185" to 2.625" in diameter**
- **Can be used in either ferrous or non-ferrous metals — plastics — ceramics, etc.**
- **Does not require skilled labor**
- **No jigs or fixtures needed**
- **Economical to operate**
- **Can be set up to operate in one minute**

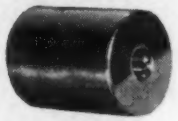
Write for a free bulletin giving details about this low-cost honing machine — or ask a Sunnen engineer to show you how it can be used on your jobs.

The coveted Army-Navy "E" waves over the Sunnen plant — evidence of the important part Sunnen equipment is playing in the war effort.

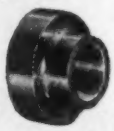
SUNNEN

Typical Jobs

Aircraft Hydraulic Brake Cylinder. Honing 3 times faster than lapping — and gave a straighter hole.



Header Die. Life of header dies increased 3 to 9 times over lapping. Knock out pin breakage practically eliminated.



Aircraft Instrument Panel Control Wire Bushing. Hole .187" diameter — held to .0002", stock removal .001", sixty per hour.

Aircraft Piston Pin. Sunnen honing is twice as fast and gives a cleaner, better looking pin.

Stainless Steel Load Compensator Valve Seat. Hole is honed to .0002" limit

Aircraft Valve Tappet Roller. Honed after grinding to give 100% bearing surface.

Aircraft Carbureter Operating Valve Sleeve. Sunnen honing eliminates distortion from assembling operation.

Automobile Distributor Shaft Gears. Taper removed at a rate of 80-90 per hour.

Roller Bearing Outer Race. Finish improved from 12 micro-inches to 2 micro-inches.

Bearing. A very small part. 2 micro-inch finish necessary.

Carbureter Idler Valve Jet. Hole is honed after reaming for smooth action.

Shell Loading Die

Cast Iron Valve Stem Guide. 1/2 to one thousandth removed — 220 pieces per hour. Better finish and straighter hole.

Hydraulic Control Bushing. Honing gives straight round hole after rough reaming.

SUNNEN PRODUCTS COMPANY, 7941 Manchester Avenue, St. Louis 17, Missouri

Canadian Factory: Chatham, Ontario

BUILDING THE RUGGED MACK PRIME MOVER CALLS FOR RUGGED MACHINES!

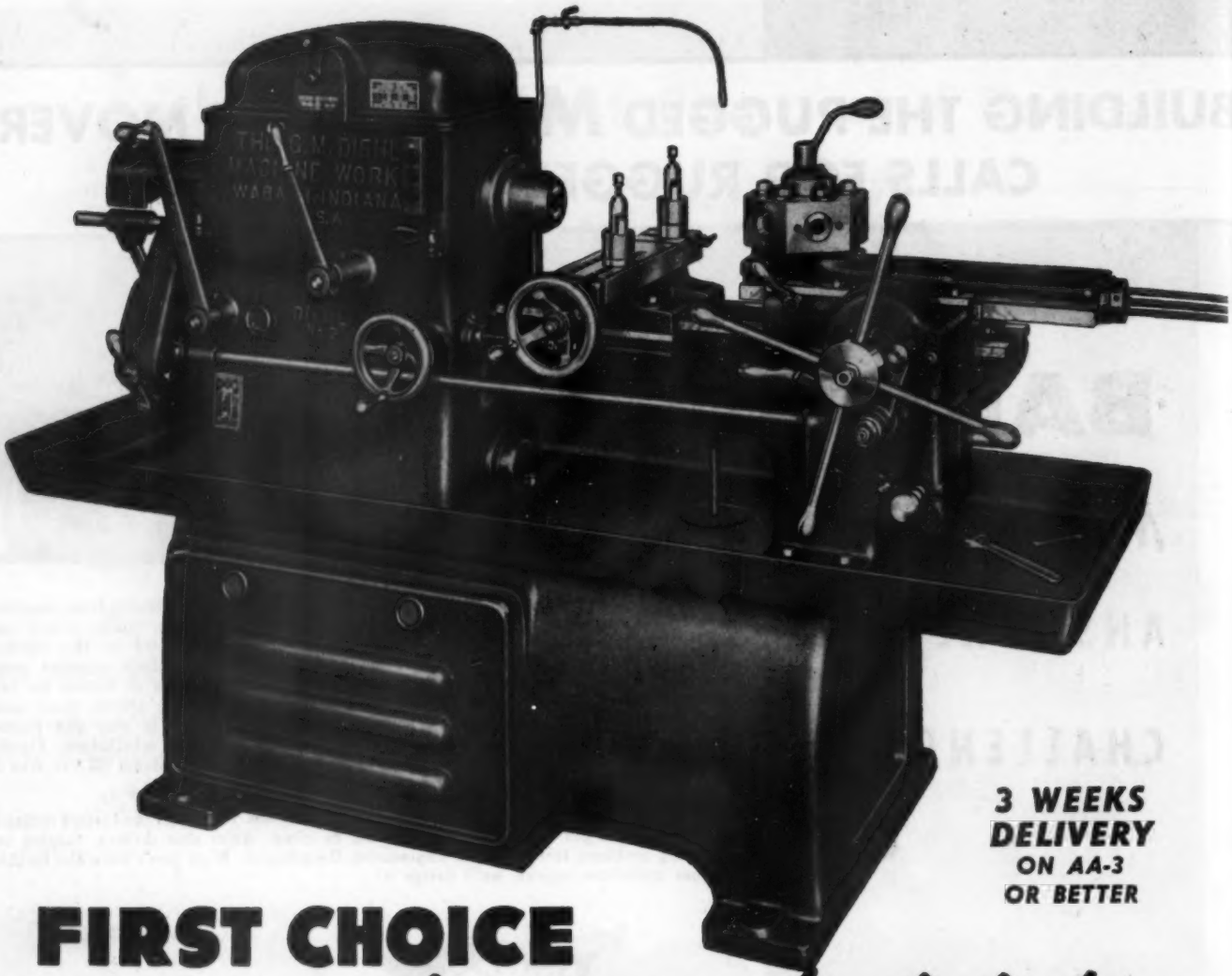
BAKER Model 30-HH ANSWERED THE CHALLENGE!

Here, BAKER Model 30-HH (a horizontal, opposed type, hydraulic feed machine) speeds manufacture of rear axle housings for Mack Prime Mover trucks, widely used by the armed forces. Operations quickly and efficiently handled on this machine include rough, second and finished boring axle-tube bores. Each opposed single spindle head has a 52" travel . . . allows tools returning clear of fixture for fast, easy change of tooling. The direct vee-belt motor drive head affords three quick speed changes, made with convenient lever controls. Cycling is easy and positive due to the innovation of a BAKER-designed quick change cycle attachment. Flexible design has been maintained, as in all BAKER units, and the Model 30-HH may be arranged to handle a variety of operations.

This example of BAKER's ability to supply machines for faster and more efficient production is but one of many that could be cited. Refer *your* drilling, tapping and boring problems to the BAKER Engineering Department. If we don't have the machine your operations require, we'll design it!

BAKER BROS., INC.
TOLEDO . . . OHIO

SINGLE AND MULTIPLE SPINDLE UNITS FOR DRILLING, BORING & TAPPING



3 WEEKS DELIVERY ON AA-3 OR BETTER

FIRST CHOICE *in many plants today*

The Diehl No. 2 Turret Lathe is designed to meet the demands for an economical lathe capable of turning out accurate work to exacting specifications. That's why it is first choice in many manufacturing plants today.

Embodying the most advanced developments, the Diehl Lathe is unsurpassed for sustained, high speed, precision performance. It works alongside other No. 2 lathes of standard make, using same tooling, including collets.

For long years of economical service, vibration-free operation with ample power to provide for extreme production requirements, you can't beat Diehl. Write today for complete specifications and illustrated brochure.

Automatic chuck capacity (round)	*1"*
Swing-over cross slide	*6"*
Swing-over bed	*14"*
Six speeds	*forward and reverse.*

WRITE FOR COMPLETE SPECIFICATIONS AND ILLUSTRATED BROCHURE ★ ★ ★

The G. M. **DIEHL** *Machine Works, Inc.*

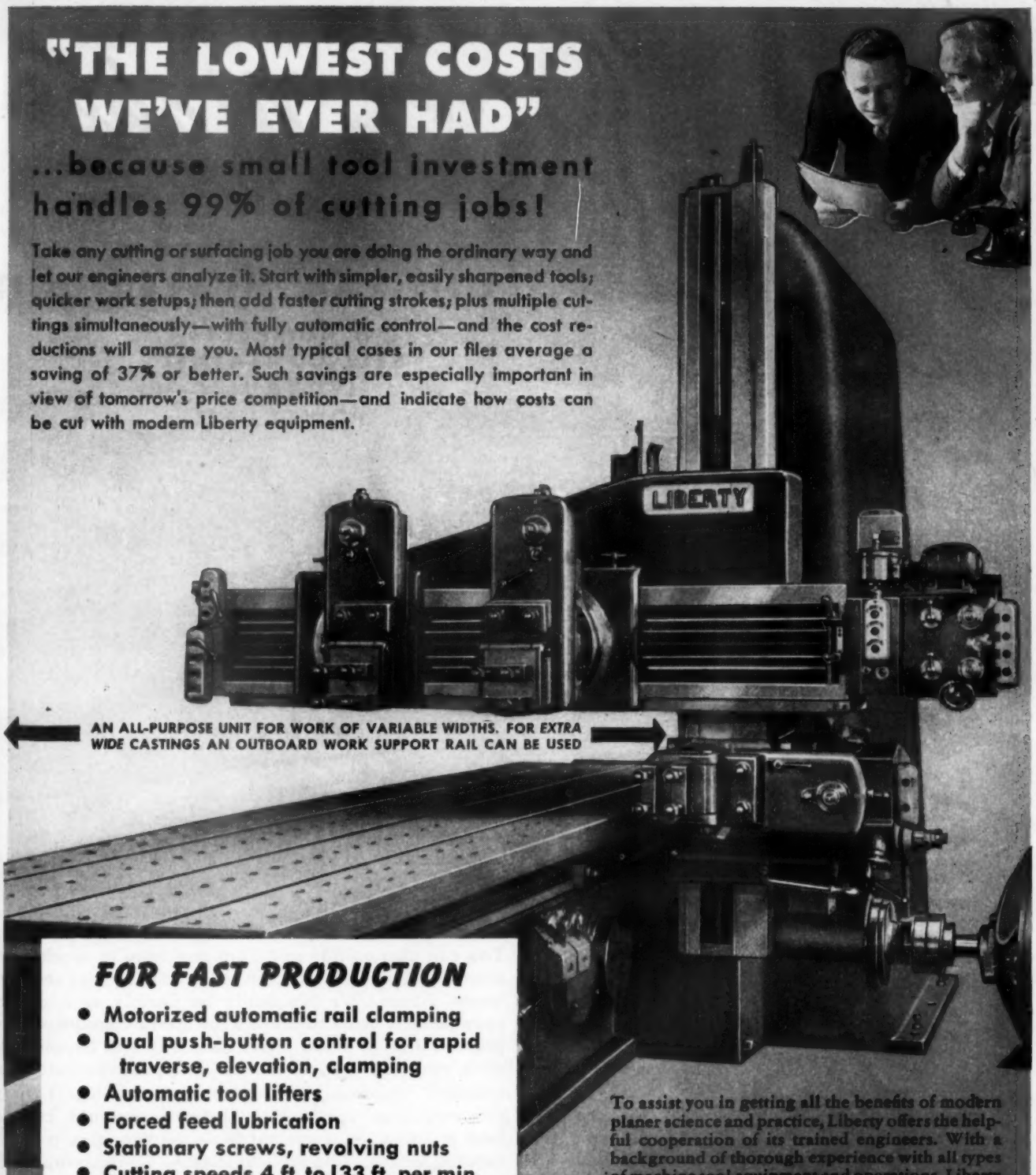
WABASH, INDIANA

Where precision craftmanship is honored

"THE LOWEST COSTS WE'VE EVER HAD"

...because small tool investment handles 99% of cutting jobs!

Take any cutting or surfacing job you are doing the ordinary way and let our engineers analyze it. Start with simpler, easily sharpened tools; quicker work setups; then add faster cutting strokes; plus multiple cuttings simultaneously—with fully automatic control—and the cost reductions will amaze you. Most typical cases in our files average a saving of 37% or better. Such savings are especially important in view of tomorrow's price competition—and indicate how costs can be cut with modern Liberty equipment.



AN ALL-PURPOSE UNIT FOR WORK OF VARIABLE WIDTHS. FOR *EXTRA* WIDE CASTINGS AN OUTBOARD WORK SUPPORT RAIL CAN BE USED

FOR FAST PRODUCTION

- Motorized automatic rail clamping
- Dual push-button control for rapid traverse, elevation, clamping
- Automatic tool lifters
- Forced feed lubrication
- Stationary screws, revolving nuts
- Cutting speeds 4 ft. to 133 ft. per min.
- Electro-mechanical feed

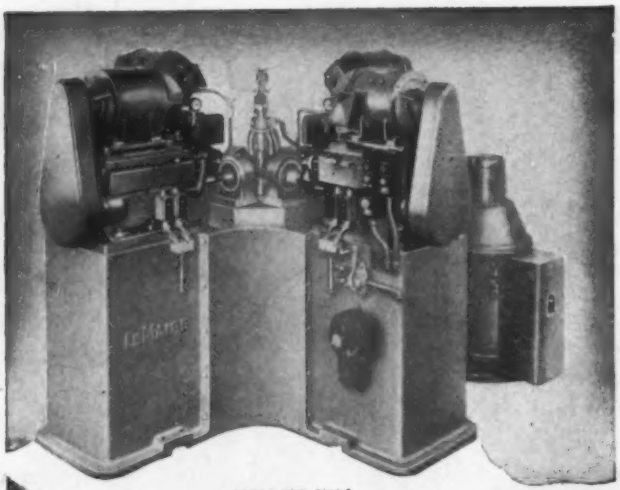
To assist you in getting all the benefits of modern planer science and practice, Liberty offers the helpful cooperation of its trained engineers. With a background of thorough experience with all types of machine tool equipment and operations, Liberty Engineers can help you get greater production faster, more accurately, automatically—at lower cost.

LIBERTY OPEN SIDE PLANERS

LIBERTY PLANERS • HAMILTON, OHIO • U. S. A.

Ask for Bulletin 152, no obligation.

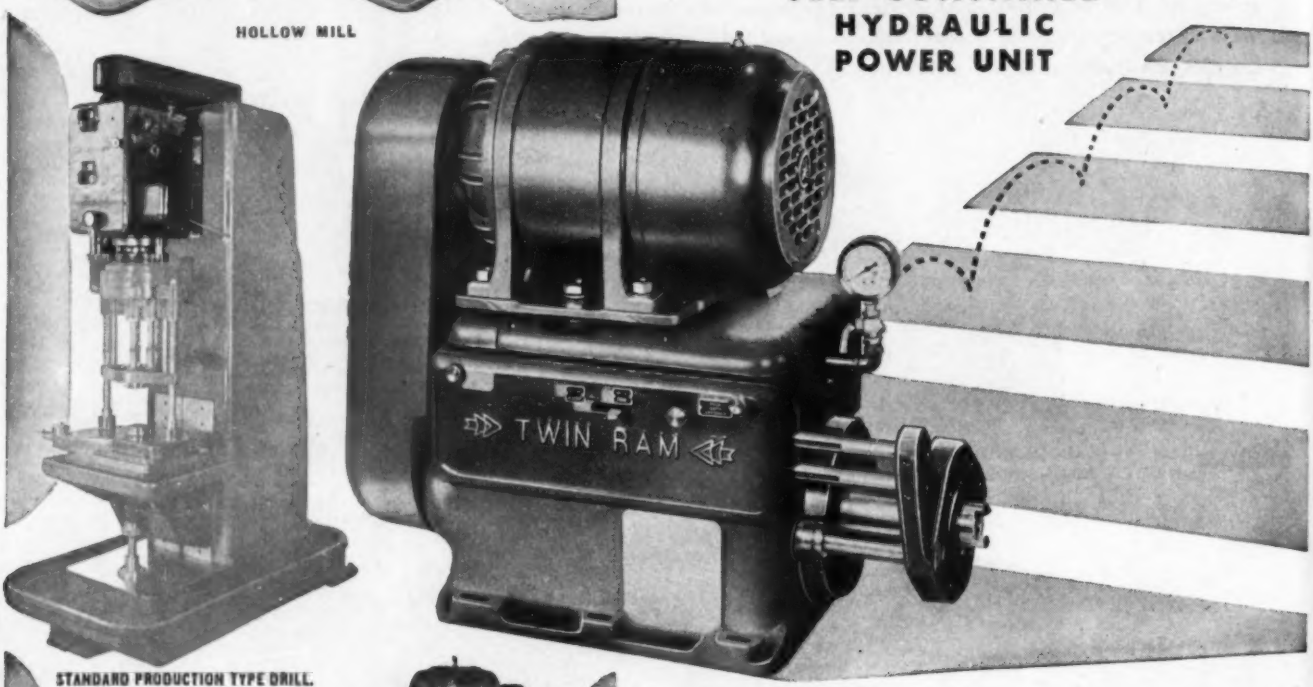
Over a Quarter Century of Specialized Experience with Time-Tested Principles of Design



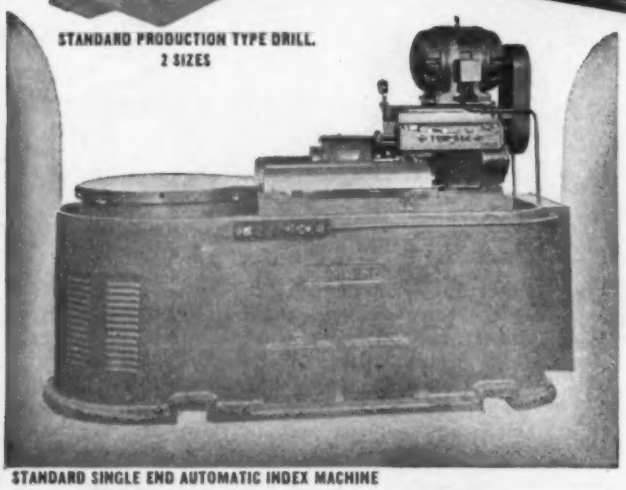
HOLLOW MILL

IT'S SIMPLE "To Make" A MACHINE NOW —if You Have a TWIN RAM MASTER UNIT

A COMPLETE SELF-CONTAINED HYDRAULIC POWER UNIT



STANDARD PRODUCTION TYPE DRILL. 2 SIZES



STANDARD SINGLE END AUTOMATIC INDEX MACHINE

You can change this unit from one base to another, or rearrange your setup on the same bed, as your requirements dictate. It's practically as flexible as a motor; only pick-off gears necessary for speed changes—units provide infinite feeds. Twin Ram Unit can be used for wide range of applications—drilling (single or multiple spindle), reaming, milling, hollow milling, boring, counterboring, spotfacing. Uniform pressure behind load is always in a straight line—the two rams prevent twisting action. Two sizes available. Capacity up to 2" in steel. Can be made to operate manually or automatically by remote control—for either right or left hand operation—with spindle rotation in either direction.

Send for folder giving complete information—spindle speeds and feed rates.

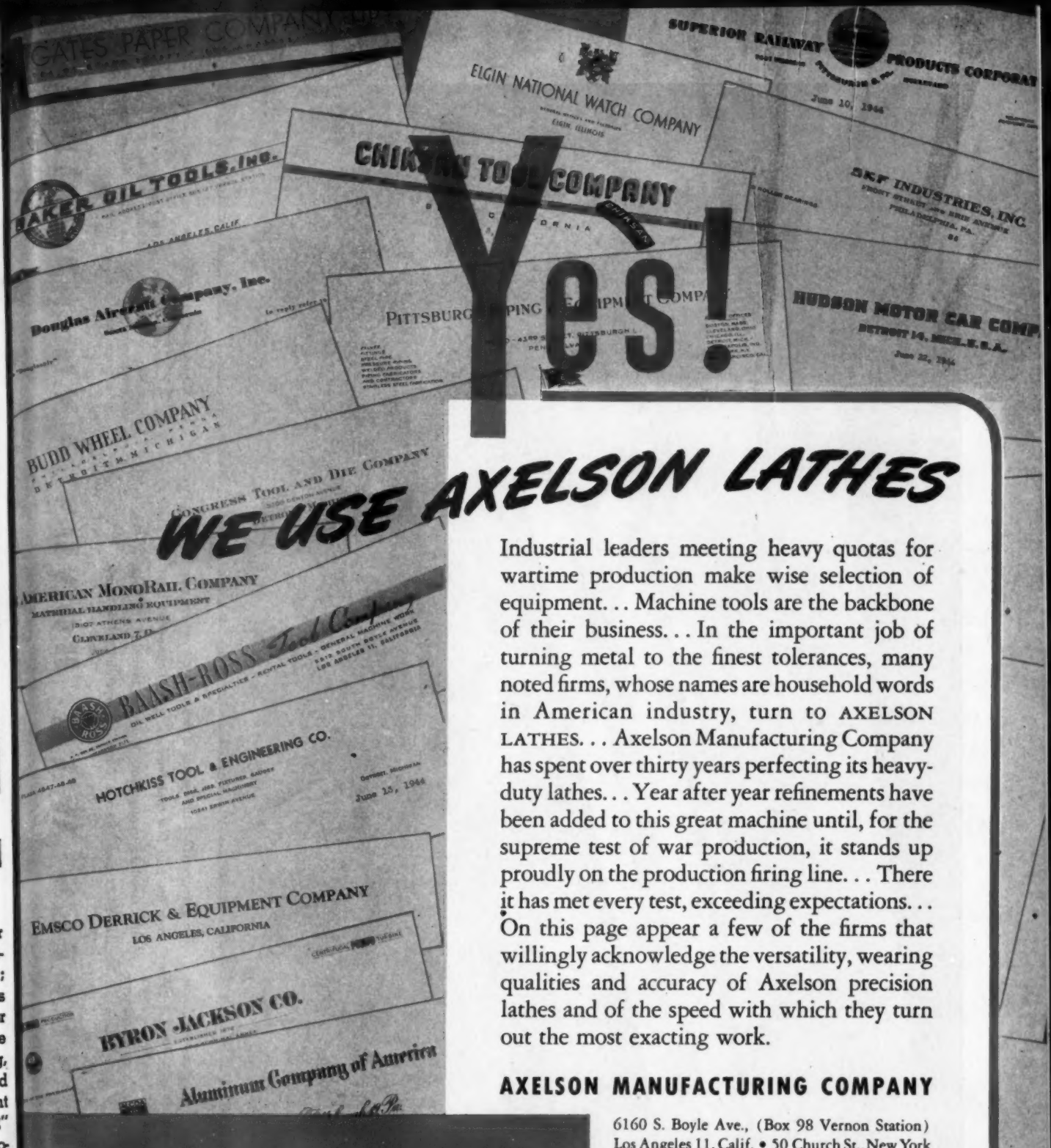
We invite inquiries regarding postwar plans.

BUY WAR BONDS

LeMaire TOOL & MFG. CO.

2665 S. TELEGRAPH ROAD ▲ DEARBORN, MICHIGAN

ENGINEERS AND BUILDERS OF PRODUCTION MACHINES



Yes!

WE USE AXELSON LATHES

Industrial leaders meeting heavy quotas for wartime production make wise selection of equipment... Machine tools are the backbone of their business... In the important job of turning metal to the finest tolerances, many noted firms, whose names are household words in American industry, turn to AXELSON LATHES... Axelson Manufacturing Company has spent over thirty years perfecting its heavy-duty lathes... Year after year refinements have been added to this great machine until, for the supreme test of war production, it stands up proudly on the production firing line... There it has met every test, exceeding expectations... On this page appear a few of the firms that willingly acknowledge the versatility, wearing qualities and accuracy of Axelson precision lathes and of the speed with which they turn out the most exacting work.

AXELSON MANUFACTURING COMPANY

6160 S. Boyle Ave., (Box 98 Vernon Station)
Los Angeles 11, Calif. • 50 Church St., New York City • 3844 Walsh Street, St. Louis, Missouri

NORRIS STAMPING AND MANUFACTURING CO.

AXELSON LATHES, of various lengths, are manufactured in 14, 16, 20, 25, 32-in. sizes.

THERE IS NO ECONOMICAL SUBSTITUTE FOR QUALITY

AXELSON LATHES

Dependable for over a Quarter Century

War plants are obtaining more production per man-hour with Niagara Power Squaring Shears because of accurate cutting, quick setting, ball bearing, self-measuring parallel back gages, full visibility of cutting line, instant acting Niagara sleeve clutch and other modern features.

Enclosed drive with gears, clutch and eccentrics running in oil assure long life and low maintenance cost. Four-edge, solid tool steel knives are standard equipment. Niagara Machine & Tool Works, Buffalo, N. Y. District Offices: Detroit, Cleveland, New York.

Shear knives available for cutting alloy and special steels. Let us know what you desire to cut. Prompt delivery on spare knives for Niagara Squaring Shears. Also factory regrinding service by the same skilled men who grind new Niagara knives.

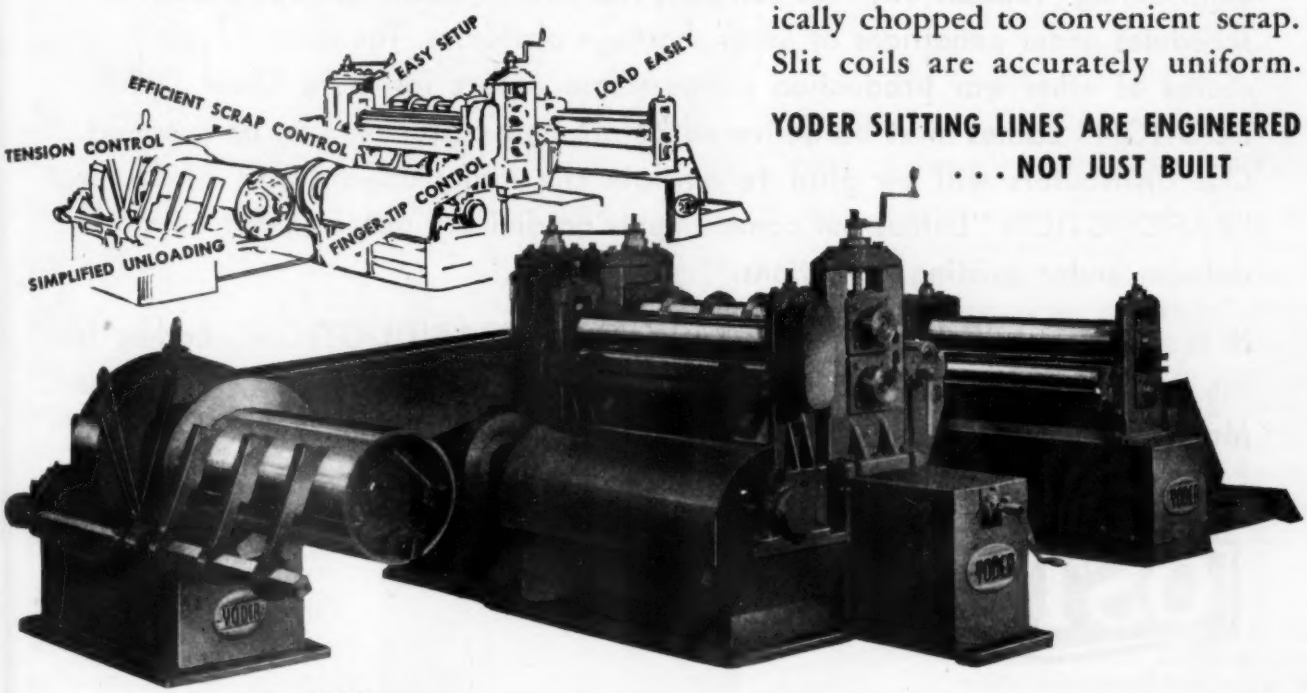
BUY UNITED STATES WAR BONDS AND STAMPS

"Yoder MAKES IT EASY FOR THE OPERATOR TO DO A GOOD JOB OF SLITTING"

Yoder slitting lines are engineered for "production with a smile". . . for easy loading of even the heaviest stock coils . . . for quick, simple set-up . . . skillful removal of finished coils. Full synchronized control of all units is at the operator's finger tips. Positive tension control gauged to ideal cutting and rewinding conditions. Edge trim is automatically chopped to convenient scrap. Slit coils are accurately uniform.

Write for bulletin giving details of these points.

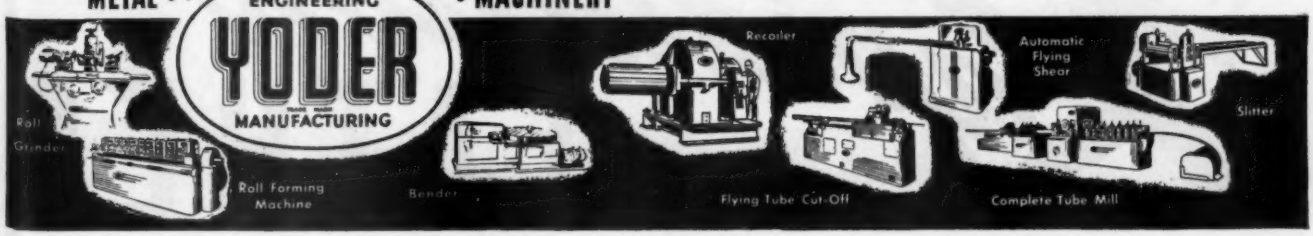
YODER SLITTING LINES ARE ENGINEERED . . . NOT JUST BUILT



METAL • WORKING • PRODUCTION • MACHINERY

ENGINEERING **YODER** MANUFACTURING

THE YODER CO., 5500 Walworth Ave., Cleveland 2, Ohio, U. S. A.



BUY UNITED STATES WAR BONDS AND

1. *"Replaces expensive machines"*

2. *"Replaces experienced workers"*

3. *"Sturdily built"*

4. *"Wide application"*

5. *"Maintains accuracy"*

6. *"Up-keep very light"*

● The above advantages of Oster "RAPIDUCTION" Turret Lathes were mentioned by an owner of these *simplified*, low cost machines as important contributing *"reasons why"* his company has kept in pace with war production schedules under conditions of labor shortage obstacles. The case is typical of scores of other war production plants whose orders for more Oster "RAPIDUCTION" Lathes must be delivered before new customers can be supplied. Our distributors will be glad to explain the many advantages of Oster "RAPIDUCTION" Lathes but commitments on delivery dates cannot be made definite under existing conditions.

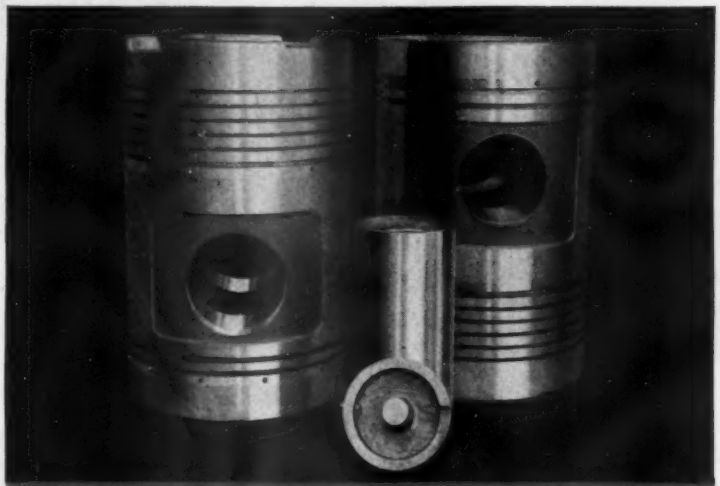
It is significant that the popularity of Oster "RAPIDUCTION" Lathes is the greatest "obstacle" to our desire to serve you promptly. The Oster Manufacturing Company, 2049 East 61st Street, Cleveland 3, Ohio, U.S.A.

OSTER

"Rapiduction" LATHES

PISTON PRODUCTION INCREASED 125%

AT DIESEL ENGINE PLANT



Diesel pistons before and after boring operations. (See tooling — operations below.)

W. F. and John Barnes Duplex Piston Boring Machine.

TOOLING AND OPERATIONS

1st OPERATION—Rough bore 2 diameters from both sides (diameters 4.985″ and 5.113″).

2nd OPERATION—Finish bore 2 diameters from both sides (diameters 5.000″ +.001″ −.000″ and 5.128 ±.001″.

TOOLING—Special sleeve or shell type boring tools with two diametrically opposed carbide tools for each diameter.

WORK MATERIAL—Aluminum alloy casting (#302 ALW).

CUTTING MATERIAL—Carboloy #44-A.

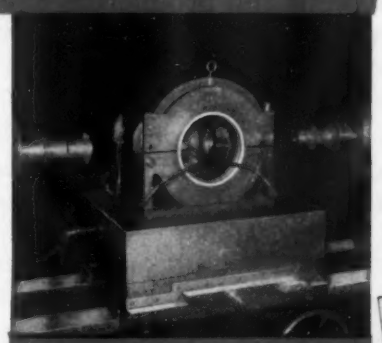
COOLANT—Kerosene.

SPINDLE SPEED—194 R.P.M.

FEED—.006″.

WORKING STROKE—4½″.

TOTAL STROKE—26″.



Special sleeve or shell type boring tools are used. Workpiece held in saddle type fixture.

2 HOLES ROUGH AND FINISH BORED AND COUNTERBORED WITH W. F. AND JOHN BARNES MACHINE

Boring time was reduced by more than one-half when this large W. F. and John Barnes duplex boring machine was put into production at a locomotive plant manufacturing 6 - cylinder diesel engines. The previous method required 45 minutes per piece. Floor-to-floor time is now only *20 minutes,* of which 15 minutes are consumed in loading, unloading and tool changing.

To bore and counterbore the two piston pin holes simultaneously, the machine has two opposing spindles and is made with two sliding head self-contained hydraulic units. Each diameter is bored by two diametrically opposed carbide tools. Special sleeve or shell type boring tools are used, fitting the arbors in the work spindles and locked by collar and screw. The workpiece is held in a saddle-type fixture.

SEND US YOUR PRODUCTION PROBLEMS

At no obligation, our engineers will analyze your requirements and suggest a machine to fill them. W. F. and John Barnes have solved machining problems for makers of products ranging from pencil sharpeners to artillery gun barrels and locomotive parts. Our equipment is large enough to machine long, heavy beds and other large machine parts — our assembly capacity can handle any machine, regardless of size. Let us make specific recommendations for your latest problem, large or small.

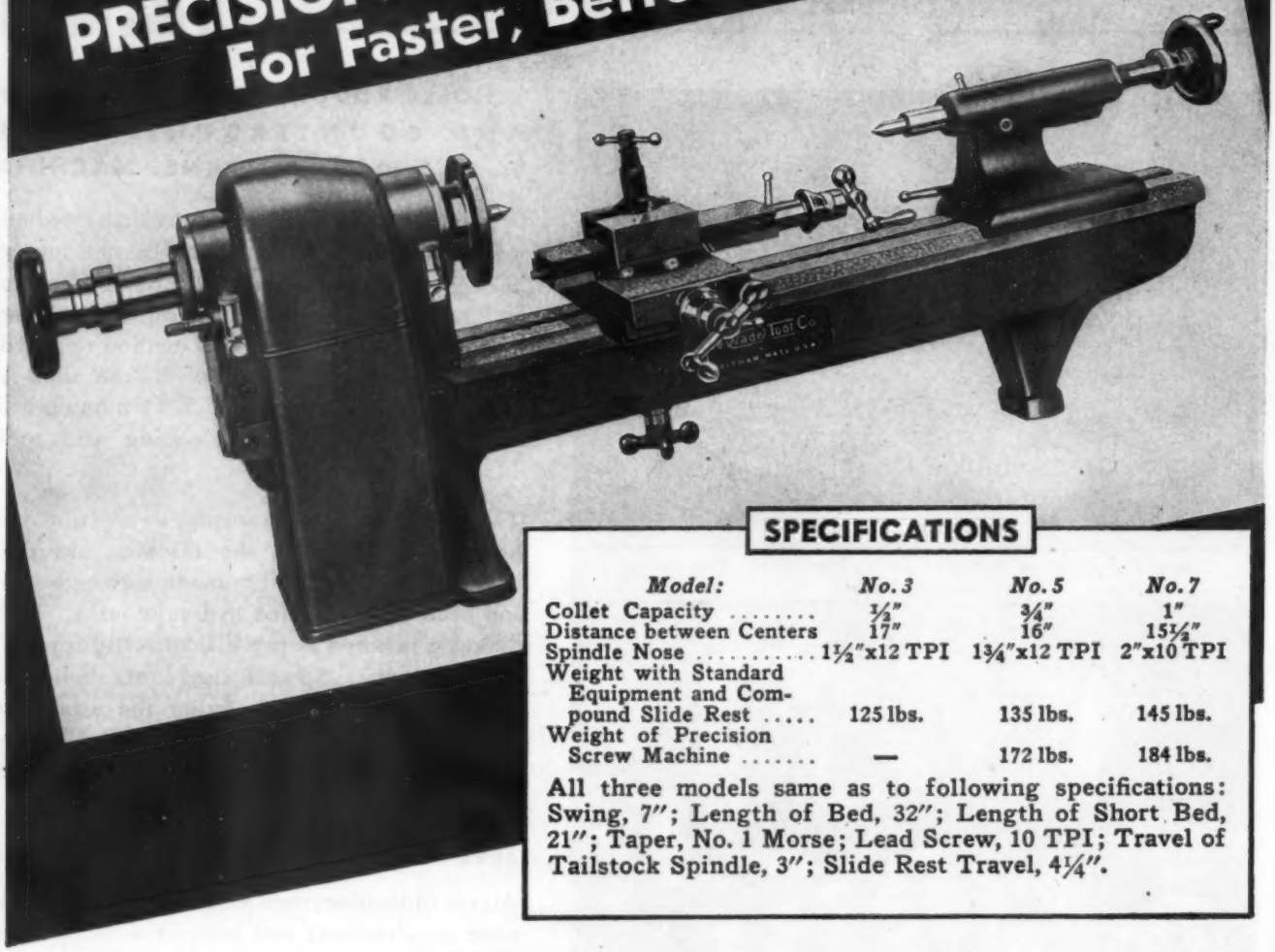
These useful booklets show how W. F. and John Barnes machines are designed to meet specific requirements. Boring, drilling, reaming, tapping and milling operations can be done simultaneously. Each booklet may suggest a tooling or production set-up you can use today. Write now — ask for Bulletin 744B

W. F. & JOHN BARNES

W. F. and JOHN BARNES

310 SOUTH WATER STREET • ROCKFORD, ILLINOIS, U.S.A.

Wade Standard PRECISION BENCH LATHES For Faster, Better Production Work



SPECIFICATIONS

Model:	*No. 3*	*No. 5*	*No. 7*
Collet Capacity	½"	¾"	1"
Distance between Centers	17"	16"	15½"
Spindle Nose	1½"x12 TPI	1¾"x12 TPI	2"x10 TPI
Weight with Standard Equipment and Compound Slide Rest	125 lbs.	135 lbs.	145 lbs.
Weight of Precision Screw Machine	—	172 lbs.	184 lbs.

All three models same as to following specifications: Swing, 7"; Length of Bed, 32"; Length of Short Bed, 21"; Taper, No. 1 Morse; Lead Screw, 10 TPI; Travel of Tailstock Spindle, 3"; Slide Rest Travel, 4¼".

Wade

Bench Lathes and Profilers
For Precision, Versatility
And Stamina

You can do faster, better production work on Wade Standard lathes because they are designed and built with features that give them top-notch efficiency for both toolmaking and production operations. They are sensitive and accurate machines that can stand the gaff and turn out plenty of work under modern conditions of quick high-low speeds, quick stops and starts.

These standard lathes are precision made . . . parts are interchangeable. Standard attachments can be added at any time to perform a wide range of machining operations . . . to meet your changing production needs. They are an exceptionally sound investment . . . they have versatility, low initial cost, low operating cost.

Write today for catalog

THE WADE TOOL COMPANY

WALTHAM 54, MASSACHUSETTS

DALZEN THREAD GRINDER, No. 5, WITH GUARDS REMOVED

IN THREAD GRINDING . . . THE *DRESSER'S* THE THING!

AUTOMATIC DRESSING IS PROVIDED IN THIS *New* DALZEN *Electronic* THREAD GRINDER

● Accuracy of a ground thread depends upon the accuracy of the dressed wheel. Precision, finish and production efficiency in thread grinding are determined primarily by the dresser.

DALZEN engineers always have recognized this fact. Now . . . the new DALZEN Electronic Thread Grinder presents the latest and best in dresser efficiency—offering new and special advantages in dressing performance.

The new DALZEN Thread Grinder with General Electric Thy-mo-trol drive provides maximum production of threaded parts, thread gages, straight and spiral fluted taps, and thread milling cutters. Grinding speed—both wheel and work—forward and reverse—is adjusted by the twist of a dial. Variation is infinite and stepless. It's an investment in *better* thread grinding, and a *low-cost* investment at that!

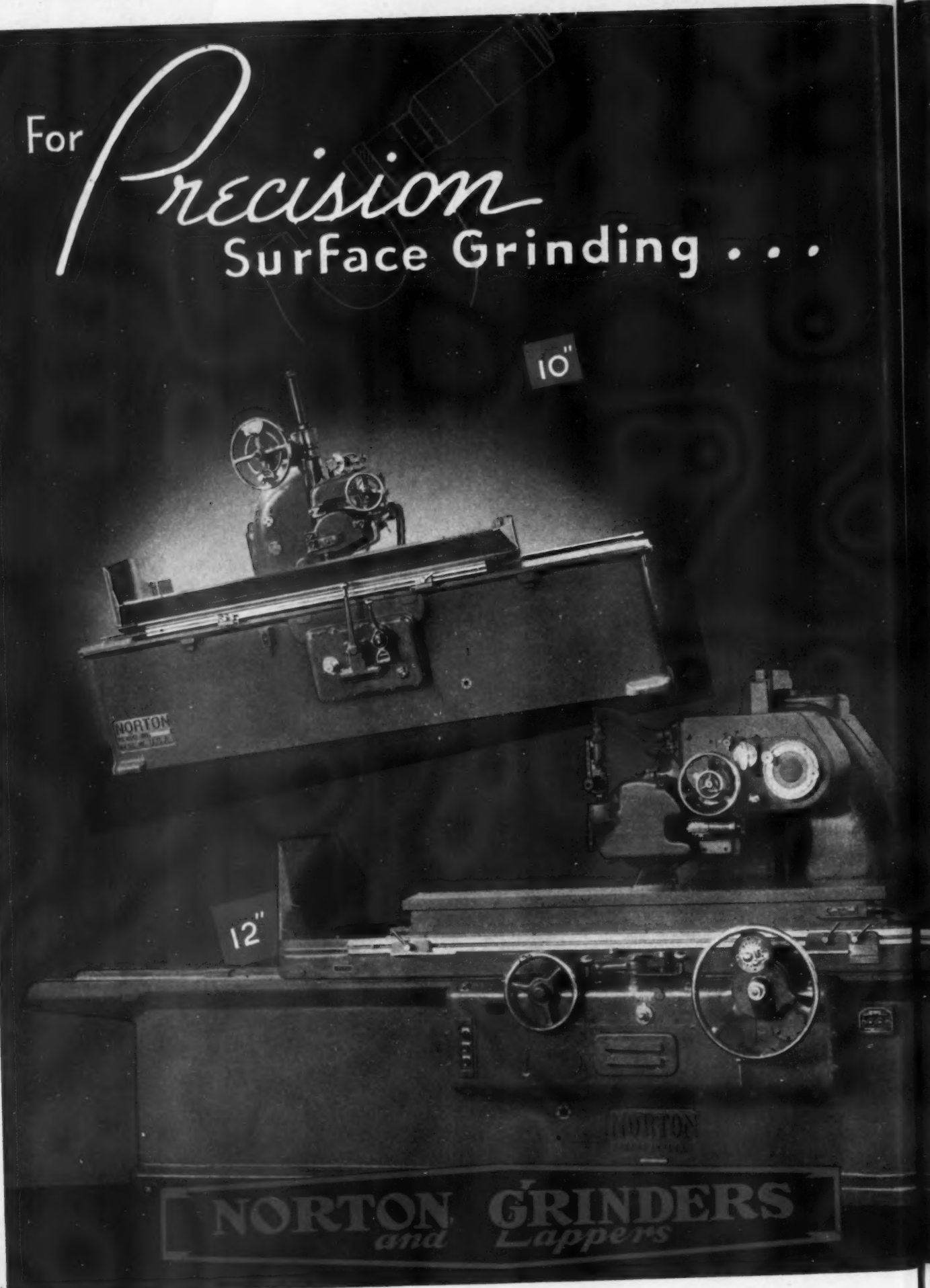
An attractive three-color folder describing the new DALZEN Models 5 and 6 will be sent you, free of charge, on request.

DALZEN

TOOL & MANUFACTURING COMPANY

12255 EAST EIGHT MILE ROAD • DETROIT (5), MICH.

For *Precision* Surface Grinding . . .



NORTON GRINDERS COVER WIDE RANGE

...for Production or Tool Room Surfacing

WHERE surface finish and dimensional accuracy must be better than average and production must be maintained at high levels, the Norton Surface Grinder fulfills the requirements of accuracy, and provides fast, convenient operation.

All the machines in the Norton line of Surface Grinders — in 6", 10" and 12" capacities — are precision-built for precision work. There is no sacrifice of stamina, however, and these surface grinders have an enviable record of long-lived, high-production accuracy.

Hydraulic operation is featured, with controls concentrated for operator convenience. Hand feeds supplement smooth power movement. Time-tested design gives easy adjustment and reduces maintenance to a cost-saving minimum throughout the full line of Norton *precision-built* Surface Grinders.

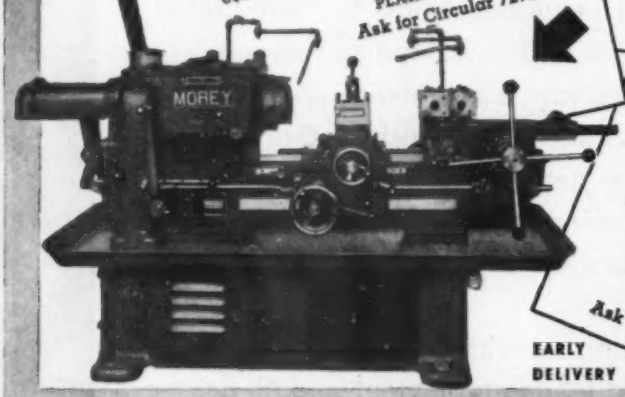
NORTON COMPANY, Worcester 6, Mass.

M-483

A Four Star Army-Navy "E" flies over the Norton Plants at Worcester.

MOREY TURRET LATHES
for BAR or CHUCKING { UNIVERSAL or PLAIN

3 UNIVERSAL
For bar stock up to 1½" in diameter
10" turning length
16½" swing over bed
Infinite spindle speeds: 55 to 1800 RPM, constant speed motor, 1200 RPM
AVAILABLE ALSO WITH PLAIN CROSS SLIDE
Ask for Circular 727A



2 PLAIN-GEARED
For bar stock up to 1" in diameter
Turning length 6½"
Swing over cross slide 6"
Swing over bed 14"
Infinite spindle speeds:
Minimum of 60 RPM.
Maximum of 2000 RPM.
Constant horsepower at all speeds.
Ask for Circular 629A

4 UNIVERSAL
For bar stock up to 2" in diameter
12" turning length
19½" swing over bed
Infinite spindle speeds: 35 to 1500 RPM, constant speed motor, 1200 RPM
AVAILABLE ALSO WITH PLAIN CROSS SLIDE
Ask for Circular 736A

EARLY DELIVERY

- INFINITE SPINDLE SPEEDS —Electrically Selected—
- DIRECT BELT DRIVE AVAILABLE AT HIGH SPEEDS ELIMINATES GEAR MARKS (pulleys supplied for).
- GEARED SPINDLE SPEEDS INSTANTLY AVAILABLE THROUGH MULTIPLE DISC CLUTCHES.
- SPINDLE MOUNTED ON TIMKEN BEARINGS.
- RIGID—WITH SUFFICIENT POWER TO TURN AT THE HIGHEST SPEEDS AND FEEDS MODERN TOOLS WILL WITHSTAND.
- SPINDLE SPEEDS AND POWER FEED CHANGES WITHIN EASY REACH OF OPERATOR.

ARMY E NAVY

THE DESIGN OF THE MOREY No. 2, 3 and 4 TURRET LATHES ARE BASICALLY ALIKE. EACH MACHINE IS ENGINEERED FOR THE SIZE WORK IT IS DESIGNED TO HANDLE.

DESIGNED AND BUILT BY
MOREY MACHINERY CO., INC
410 BROOME STREET, NEW YORK 13, N. Y.
PLANT: 4-57 26TH AVE., ASTORIA 2, NEW YORK

No. 101 "PRODUCTION" CENTERLESS FEED POLISHING MACHINE

Write for illustrated folder.

No centering, chucking or holding, just . . . feed automatically!

Work of superior quality can be produced on this machine even in the hands of inexperienced operators. It is adaptable to polishing, finishing and buffing any cylindrical work to whatever degree of finish required. Better finishing at lower cost is assured.

Features include: a sturdy wheel head, a simple wheel trueing device for use with wheels in motion, a patented centerless feed and an adjustable work support. All parts are guarded but easily accessible. Handles work from ⅛" to 6" diameter.

PRODUCTION MACHINE CO.
Manufacturers of Drilling Machines, Tool Grinders and Hand and Automatic Polishing and Grinding Machines.
GREENFIELD, MASS., U. S. A.

PORTAGE

HORIZONTAL BORING, DRILLING AND MILLING MACHINE NO. 4

• Featuring an extended saddle and table with outer rail support for maintaining exceptional accuracy on long work. Get fully acquainted with the many features of this modern Boring Mill. *Ask for a copy* of our new instructive bulletin which points out the numerous advantages of this new Horizontal Boring, Drilling & Milling Machine.

THE PORTAGE MACHINE CO.
AKRON 11, OHIO

It's a quicker, more accurate, less wasteful way of doing the job. And for those same good reasons *modern* tool rooms are equipped with

The SELLERS DRILL GRINDER

This method of grinding automatically produces the scientifically correct drill point required for precision work. Angles of inclination are equal, contour of lips is identical, resulting in a point that drills true cylindrical holes faster with more holes per grind.

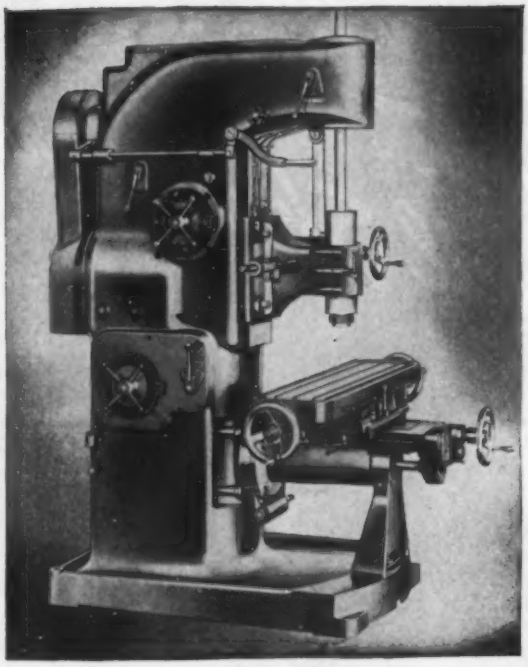
Inexperienced girls are quickly trained to turn out a constant supply of perfect drill points, reducing both your drill inventory and drilling costs.

For proof of why it will pay you to equip your tool room with this modern machine, send us three drills of any size up to 3 ins. and we will return them ground with the Sellers point. No charge, no obligation. Wm. Sellers & Company, 1610 Hamilton St., Philadelphia.

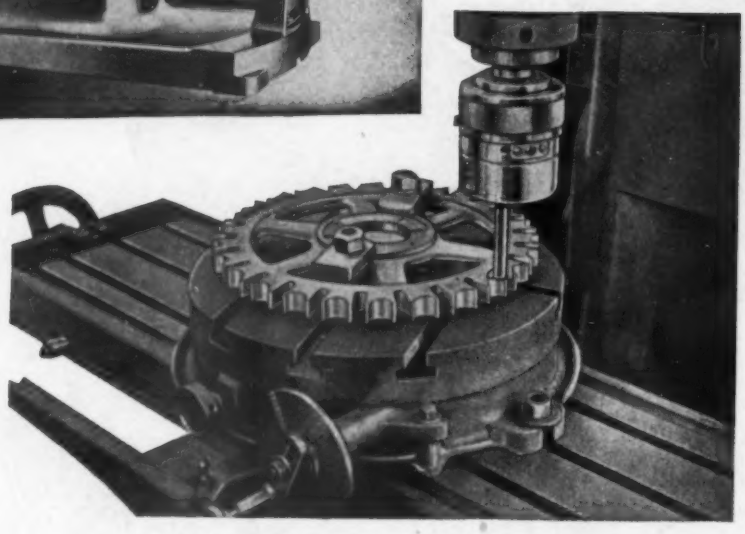
SELLERS DRILL GRINDERS

© 1943, Wm. Sellers & Co.

SELLERS PRECISIONEERING SINCE 1848



THE VERSATILE ALL-PURPOSE KNIGHT Miller EQUIPS YOU FOR UNUSUAL CAPACITY



You get that all important "ACCURACY"

The geneva cam in this picture illustrates a typical job requiring accurate milling, boring, and spacing. The slots between the cam tracks had to be the same width and depth, the cam tracks all the same radius, and the spacing from center to center of each exactly the same. This was done quickly as well as accurately on a KNIGHT Miller equipped with indexing rotary table.

- ★ Speed and Accuracy for light milling
- ★ Power and Rigidity for heavy cuts
- ★ Difficult and Unusual Parts handled quickly and accurately without special equipment
- ★ Limited and Special Production done economically and quality maintained without special tooling
- ★ Internal and External Milling done at one setting

● The KNIGHT Miller's wide range of spindle feeds, solid table unit, ease of handling combine with other features to give you unusual capacity whether for light milling, heavy milling, or precision boring.

These milling machines will perform and produce at any of their speeds and feeds to the full capacity of the motor installed.

Capacity too is realized because of the short time necessary for making set-ups even though they are difficult ones. Additional set-ups in most cases are eliminated — some are greatly simplified.

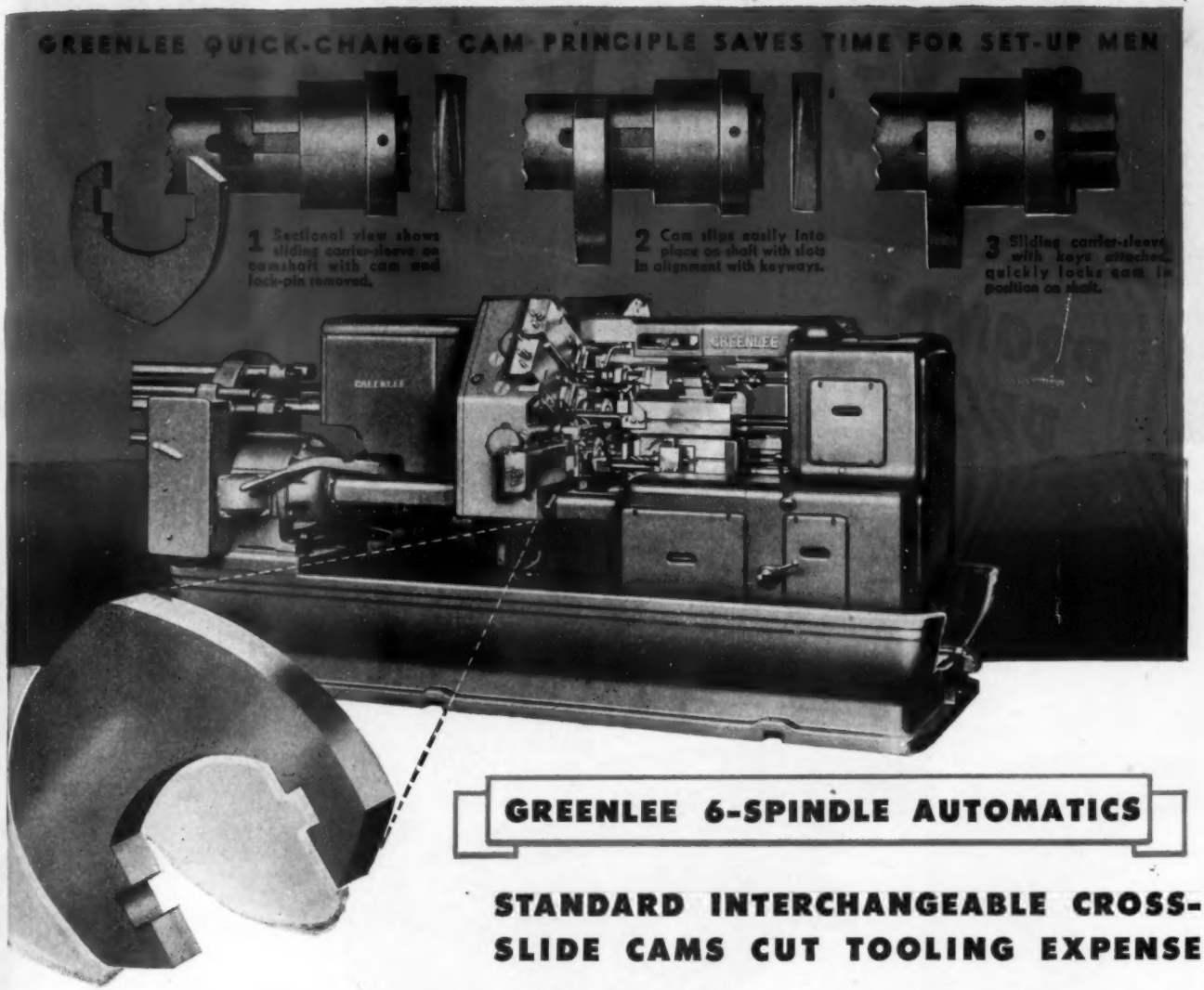
There is quick and accurate location of holes and surfaces — particularly so when dial indicators are used. To change vertical settings you simply move the spindle rather than the work. Added to all this is the fast method of changing cutting tools.

To get the full story on the fast, compact, complete, and convenient-to-handle KNIGHT Miller, write for catalog.

KNIGHT VERSATILE ALL-PURPOSE MILLER

IMMEDIATE DELIVERY SUBJECT TO PRIOR ORDER

W. B. KNIGHT MACHINERY CO.
• ST. LOUIS, MISSOURI •


GREENLEE QUICK-CHANGE CAM PRINCIPLE SAVES TIME FOR SET-UP MEN
1 Sectional view shows sliding carrier-sleeve on camshaft with cam and lock-pin removed.
2 Cam slips easily into place on shaft with slots in alignment with keyways.
3 Sliding carrier-sleeve with keys attached quickly locks cam in position on shaft.
GREENLEE

GREENLEE 6-SPINDLE AUTOMATICS

STANDARD INTERCHANGEABLE CROSS-SLIDE CAMS CUT TOOLING EXPENSE

Simplicity of design makes it possible, today, to operate Greenlee Automatics effectively on more than just the ordinary "cut-and-dried" multiple-spindle screw machine jobs. The cross-slide cam feature on the Greenlee, *for example,* promotes production efficiency on many short-run jobs by reducing set-up time and through savings in tooling expense.

As shown in top photos, individual cams (only one used for each independently operated cross-slide) are quick and easy to slip on or off. All cams are completely interchangeable and may be used on any cross-slide. Thus, only a very few are required — see details at left.

There are other *time-saving, cost-saving* Greenlee features, too, that offer production advantages in building weapons of war or products of peace. Ask for latest details. Perhaps Greenlee engineers can help you tie in war demands, today, with your peace conversion plans. *Write* —

GREENLEE BROS. & CO., 1735 MASON AVE., ROCKFORD, ILL.

SMALL CAM INVESTMENT HANDLES 90% OF AVERAGE JOB-SHOP REQUIREMENTS

With a Greenlee 6, a job-shop can handle 90% of average requirements with but fifteen *standard* cross-slide cams which provide a wide variety of feeds and strokes. *Seldom are special cams required.* An exclusive Greenlee feature eliminates the use of cams on main tool slide.

The following list of cams are all that are usually needed for one machine to serve a wide range of requirements:

Quantity	*Cam Ratios
2	2:1
3	3:1
3	4:1
2	5:1
3	6:1
1	8:1
1	Cut-Off

TOTAL INVESTMENT... ONLY $131.35

*Standard cams are made in ratios to tool-slide feed and stroke. For example, 2:1 Cam = ½ feed of tool-slide and ½ stroke. Feed = feed per revolution.

GREENLEE

MULTIPLE-SPINDLE DRILLING, BORING, TAPPING MACHINES • AUTOMATIC SCREW MACHINES • AUTOMATIC TRANSFER PROCESSING MACHINES

ABRASIVE

No. 1½ HAND FEED SURFACE GRINDER

PROMPT DELIVERY

Hand Feed . . . ideal for short-run precision jobs. Motor integral with wheel head — no belts, sprockets or chains. Large hand wheels, conveniently located, permit continuous operation with minimum fatigue. Unusual capacity: 15" long x 10" wide x 12" high. ABRASIVE design and precision workmanship recommend the No. 1½ for the finest type of flat, form and gage grinding.

ABRASIVE

ACCURACY BOOSTS PRODUCTION

Send for Bulletin and Complete Specifications

ABRASIVE MACHINE TOOL CO. • EAST PROVIDENCE 14, R. I. • *Dealers in Principal Cities*

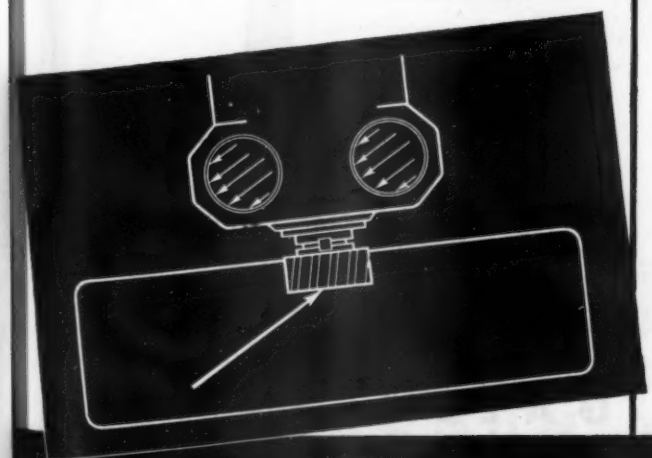
Balanced load!

Kent-Owens No. 1-14 Milling Machine with improved Hydraulic Control. Table 32"x9" table travel 14".

Exclusive
MOUNTING BETWEEN TWO POSTS

Only Kent-Owens Milling Machines are designed with the head mounted on twin posts — assuring balanced load in either direction. There is no overhang and no cocking action. The head is mounted on two cylindrical ground steel posts which carry the spindle midway between them. Shop men like its performance — an unusually rigid and accurate machine, practically chatter-proof for either direction of table travel. Send for bulletin.

KENT-OWENS MACHINE COMPANY... TOLEDO, OHIO



THERE'S A KENT-OWENS REPRESENTATIVE NEAR YOU

BOSTON
General Machinery Corp.

BUFFALO
Don W. Patterson

CHICAGO
Neff, Kohlbusch & Bissell

DALLAS
Hamilton-Huster Machinery Co.

DAYTON
Gosiger Machinery Co.

DETROIT
A. C. Haberkorn Machinery Co.

GRAND RAPIDS
Joseph Monahan

HOUSTON
Oliver H. Van Horn Co., Inc.

INDIANAPOLIS
Oatis-Booth Machinery Co.

KANSAS CITY
Eichman Machinery Co.

LOS ANGELES
Eccles & Davies Machinery Company
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MINNEAPOLIS
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F. F. Barber Machinery Co.

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F. W. Schiefer Machinery Company

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J. F. Owens Machinery Co.

TORONTO
F. F. Barber Machinery Co.

WALKERVILLE
F. F. Barber Machinery Co.

Call on KENT-OWENS *for Milling Machines*

Whittle milling costs... WHILE YOU WHITTLE CHIPS

THERE'S no doubt about it—milling costs are being whittled to a new low by carbide tipped CAL-CUTTERS regardless of the metal being machined . . . alloy steel, heat-treated steel, tough bronze, cast iron, fast cutting dural, aluminum or brass—you name the job—CAL-CUTTER is your milling cutter!

CAL-CUTTERS are massively built—both in body construction and husky tip sizes. You get a cutter with rigid support behind the tips—with ample body weight on the big cutters to smooth out interrupted cuts as well as a wide selection of types and sizes for every milling requirement. CAL-CUTTERS lick every job, stay on the job, lower milling costs!

CAL-CUTTER Hyper Face Mill for alloy and heat-treated steels.

A few good territories open for active experienced distributor organizations.

Remember—you can mill it faster and mill it better with a carbide tipped CAL-CUTTER!

MACHINERY MANUFACTURING COMPANY
1915 EAST 97th STREET • LOS ANGELES 11, CALIFORNIA
Vernon Line of HORIZONTAL MILLS, VERTICAL MILLS and JIG BORERS, SHAPERS and GRINDERS

SIGOURNEY M-100

RIGID CONSTRUCTION FOR MAINTAINED ACCURACY

The Sigourney M-100 Drilling Machine is a fine precision tool ruggedly constructed to maintain its accuracy throughout a long service life and under the most demanding schedules.

It has sealed ball bearings throughout . . . hardened and ground spindles . . . speeds, from 4000 to 10,000 R.P.M. . . . and is available in 1, 2, 3, and 4 spindle models. All moving parts except chuck and drill are completely enclosed, insuring maximum operating safety.

Send for illustrated Bulletin

THE SIGOURNEY TOOL CO.

Hartford 6, Conn.

Sole Sales Agents

PRATT & WHITNEY

Division Niles-Bement-Pond Co. West Hartford, Connecticut

Grand Rapids

DRILL AND TAP GRINDERS

Model 10-B

Other Combinations Also Available

Sharpens Taps, 2, 3 and 4 Flute, Right or Left Hand. Sizes No. 6 to one and one half inches.

Sharpens Drills, 2 and 3 Flute, Straight or Taper Shank. Sizes from one eighth to one and one half inches.

GALLMEYER & LIVINGSTON CO.

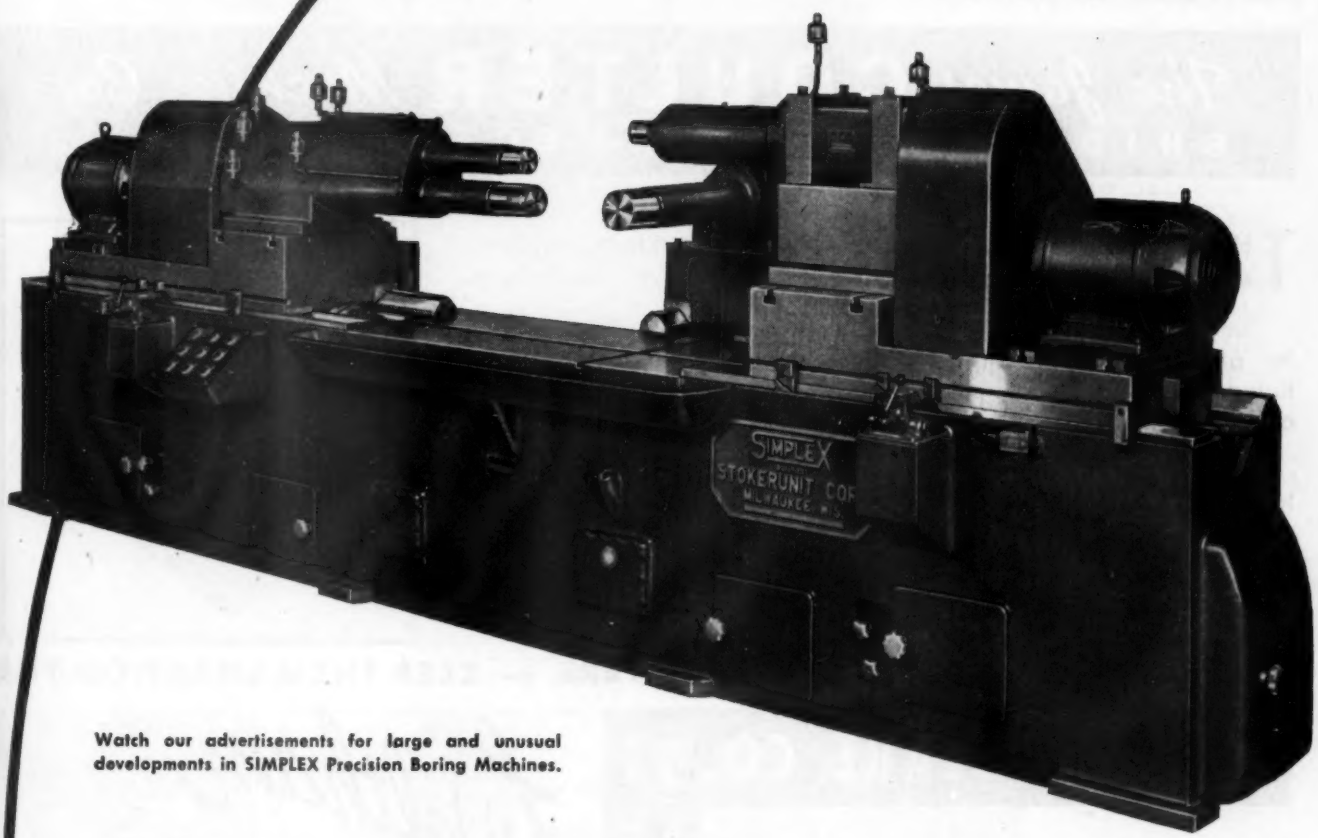
330 Straight Ave. S.W.

GRAND RAPIDS (4) MICH.

SIMPLEX

When a leading tractor manufacturer contracted to build a transmission for a military tractor, they realized they could not take any chances with Government inspection. A SIMPLEX 3U 3-way Precision Boring Machine, large enough to bore a unit 4' long, made a quick and easy job of getting them out swiftly — and right!

The transmission case was approximately rectangular, 48" long, 19" wide and 21" high. There were six bores, ranging from 2¾" to 6½". Most of them were located so deep in the casting that extension type spindle heads were necessary. With this arrangement there was very little tool overhang, accuracy was easily maintained, tool life increased, chatter avoided.



Watch our advertisements for large and unusual developments in SIMPLEX Precision Boring Machines.

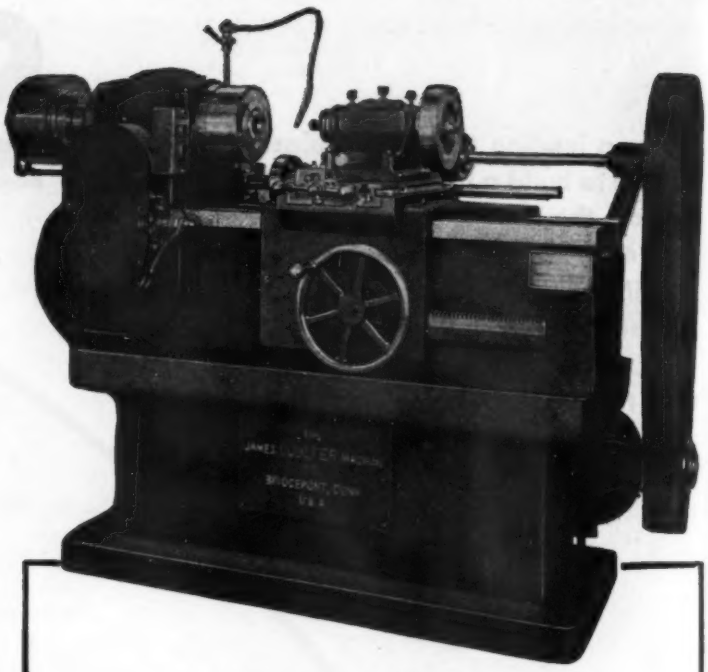
Precision Boring Machines

STOKERUNIT CORPORATION

SIMPLEX Precision Boring Machines and Planer Type Milling Machines

4524 West Mitchell Street, Milwaukee 14, Wisconsin

Keep Ahead of
DEFENSE DEMANDS
on the PRODUCTION of
EXTERNAL and INTERNAL
THREADS



The Coulter Type "H" Hob Thread Miller—modern in every detail of design and construction—handles high speed, accurate production of right or left hand threads. Any parts that can be held in ordinary chucks, air operated chucks, air operated collet chuck or special face plate fixture can be threaded on this machine.

Work holding spindle and cutter spindle are driven by individual motors through worm and gears. Speed changes to work spindle are accomplished by pick-off gears; cutter spindle speeds are controlled by variable motor sheave. All high speed shafts turn in anti-friction bearings.

Maximum external thread, 7"; minimum hole depends on smallest hob practical.

Send for Descriptive Bulletin giving full information.

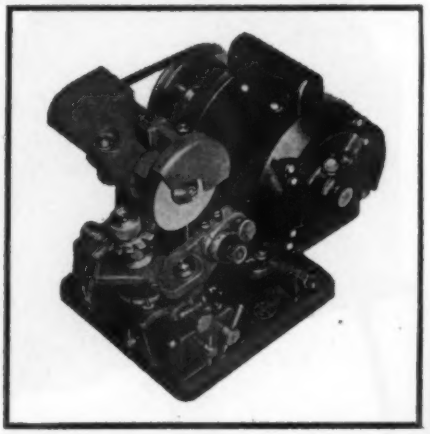
The James COULTER *Machine Co.*
BRIDGEPORT · CONNECTICUT · U.S.A.

THE performance of your machines is directly related to cutter efficiency. The most economical cutter is one that's *kept* sharp.

The new Waltham Cutter Sharpener is designed to sharpen tools for gear cutting and thread milling, circular form tools, straight fluted hobs, and multiple cutters—and, to do this quickly, accurately, and economically.

One, or more, of these sharpeners will soon pay for itself in the tool room or when used with your machines on the production line.

Maximum cutter capacity is 2" diameter and 3/8" thick—complete details will be found in the new folder No. 344. Mail the coupon for your free copy!



DULL CUTTERS ARE EXPENSIVE CUTTERS — KEEP THEM SHARP ON THE

EDWARD BLAKE CO.

634 COMMONWEALTH AVENUE
NEWTON CENTRE 59, MASS.

Please send folder No. 344 giving complete details on the Waltham Cutter Sharpener.

Name ..... Title .....

Company .....

Street .....

City ..... State .....

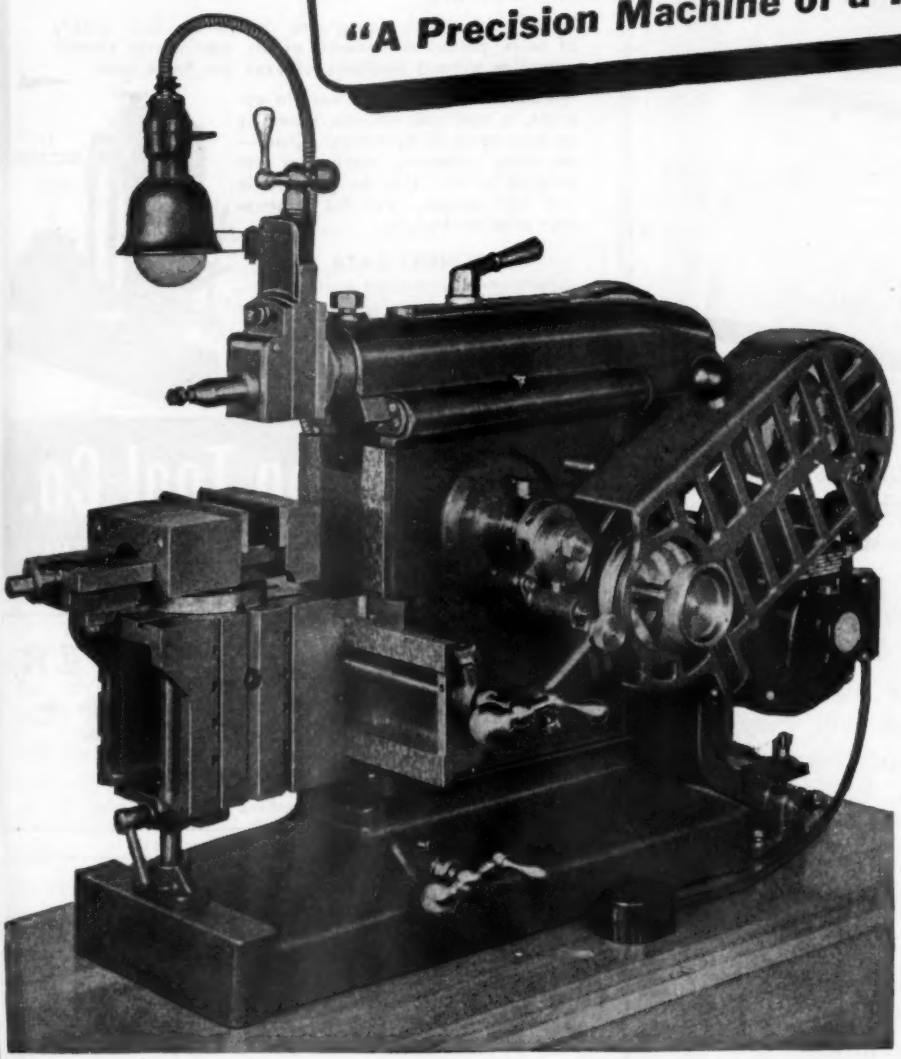
A.M.

Waltham CUTTER SHARPENER

Available with index plates or pawl locating attachment

BLAKE TAP GRINDERS—L & D HIGH SPEED DRILL PRESSES—WALTHAM CUTTER SHARPENERS—AMERICAN TOOL HOLDERS—BLACK DIAMOND PRECISION DRILL GRINDERS—FILTAIRE PORTABLE DUST COLLECTORS

AMMCO
7" SHAPER
"A Precision Machine of a Thousand Uses"



A wide variety of jobs can be done accurately, quickly, easily and economically on the AMMCO 7" Shaper.

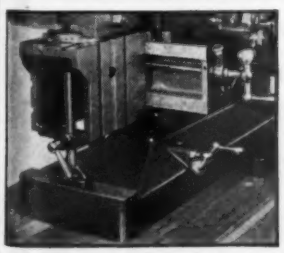
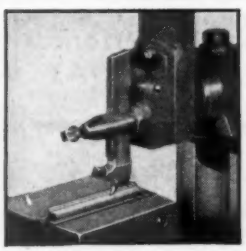
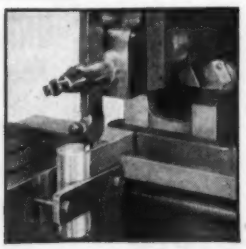
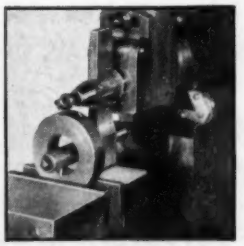
This precision machine has proved itself an essential machine tool for handling exacting jobs in industrial plants, the army, the navy, the marine corps, in mobile machine shops, government agencies, laboratories, tool makers shops, technical schools, etc.

Construction incorporates many features you would expect to find only in larger, more expensive machines... For example: WAYS of ram, tool head, and front face of the main frame are of the "VEE" type, hand scraped to insure accuracy and long life.

Available for stationary installation or as portable unit ...Portable model is mounted on sturdy maple cabinet, and can be rolled from job to job ...Just plug in to an electrical outlet, and go to work. Saves steps and time.

★

Has "VEE" Type Ways . . . Handles a wide variety of work . . . Accurate . . . Portable

Write today for specifications and prices

ARMY E NAVY

AMMCO 2100 COMMONWEALTH AVENUE NORTH CHICAGO, ILLINOIS

★ ★ ★ "Next best to *knowing* is *knowing how to find out.*" That's why we published this file-size folder—**ON CAMPBELL ABRASIVE CUTTING MACHINES.** It's a time-saver because it gives you a quick highlight picture of the complete range of Abrasive Cutting Machines made by Campbell. It may suggest to you the particular machine that will help you with your specific cutting problems. You'll want a copy for your files.

Another way to "find out" is this: write to us stating (1) the materials you are cutting, (2) shapes and sizes, (3) lengths before cutting, (4) lengths of cut-off pieces and (5) required production per hour. With this information, Campbell engineers can work up cost sheets for you and recommend production procedure, based on actual records.

Write for the above folder—or for information on your specific cutting problem.

Campbell

ABRASIVE CUTTING MACHINES

ANDREW C. CAMPBELL DIVISION
BRIDGEPORT • CONNECTICUT
ALSO MAKERS OF A COMPLETE LINE OF NIBBLING MACHINES

ACCO
AMERICAN CHAIN & CABLE COMPANY, Inc.
BRIDGEPORT • CONNECTICUT

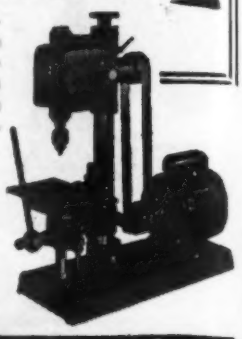
For Sensitive Tapping of Precision Work

HAMILTON-MUEHLMATT SENSITIVE TAPPING MACHINE

• Here's a high speed, sturdy little tapping machine which is especially adapted to precision tapping of light work. It is now being used very successfully for tapping parts for instruments, cameras, watches, clocks and business machines.

It has gained wide acceptance due to the high quality of work produced because of its particularly smooth operation without breakage of even the finest taps.

Mechanically simple and easy to operate, a man can become expert in an hour or so of operation. Quiet—no noisy reversing mechanism nor slinging of oil. Can be plugged in any light socket. For full information write for bulletin.



PERTINENT DATA

Capacity—From smallest and finest tap to 10-32 inclusive.
Power 1/6 H.P. 1750 R.P.M. Motor either CI-AC or compound DC.
Tapping speeds approx. 1200 to 2600 R.P.M.
Size of machine—16 in. x 7 in. x 22 in. high
Weight—Approx. 60 pounds

The Hamilton Tool Co.
830 NINTH ST. HAMILTON, OHIO

DAVIS KEYSEATER

This low cost machine will handle internal keyseating jobs up to 1¼ in.

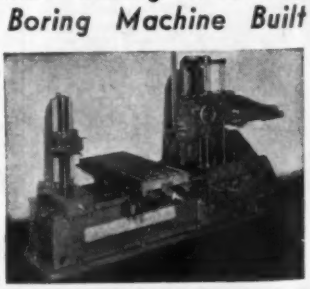
Write for illustrated bulletin.

DAVIS KEYSEATER CO., 403 Exchange St., Rochester, N. Y.

SMITH & MILLS
CRANK SHAPERS
sizes 12" to 32" stroke
THE SMITH & MILLS CO. Cincinnati, Ohio

UNIVERSAL *Horizontal Boring Machine*
The only TRIWAY *Boring Machine Built*

Made in 3" and 4" spindle sizes. Write for complete, detailed specifications.



Standard Universal 3" Spindle Machine

UNIVERSAL BORING MACHINE CO.
Hudson, Mass., U. S. A.

WE'RE IN THE FIGHT...
...on Every Industrial Front!

IN a large number of major war industries, equipment that was designed and fabricated by Kirk & Blum is increasing plant efficiency, speeding production, cutting costs, reducing absenteeism . . . helping to win the war.

Kirk & Blum methods, founded on 36 years of experience, rule out guesswork. Whatever your problems in Dust or Fume Control, Industrial Ovens, Glass Cooling Systems, or Sheet Steel Fabrication, you will be wise to take advantage of Kirk & Blum's *specialized* designing and manufacturing facilities. The unbiased counsel and expert planning and supervision of the K & B Engineering Staff is your assurance of accurate workmanship, true economy, and top performance.

For complete details, write to The Kirk & Blum Manufacturing Co., 2823 Spring Grove Ave., Cincinnati, Ohio.

A FEW OF THE MANY ORGANIZATIONS RECENTLY SERVED BY

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AN ORGANIZATION OF ENGINEERS AND MECHANICS

● **DUST CONTROL SYSTEMS**

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● **GLASS TANK AND MOULD COOLING SYSTEMS**

Libbey-Owens-Ford Glass Co.
Armstrong Cork Co.
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Ball Bros. Co.
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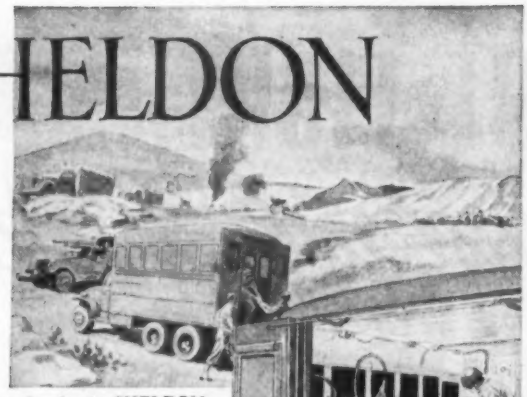
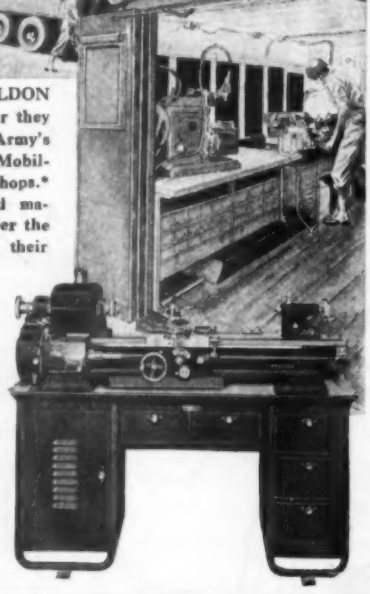
★ **END IT QUICKER . . . BUY MORE WAR BONDS!**

SHELDON



Wherever our Armies go, SHELDON LATHES move with them for they are basic equipment in the Army's Mobile Machine Shops and Mobilized Instrument Repair Shops.* These compact truck-mounted machine shops are found wherever the going is toughest for it is their job to keep all mechanized ordnance operating efficiently. It's a big assignment, and we are proud that SHELDON Precision Lathes are selected to handle it. *SHELDON Lathes are also standard in the Marine Corps Mobile Shop Trailers and on many Naval Craft.



SHELDON MACHINE CO., Inc.

4234 N. Knox Ave.,
Chicago 41, U. S. A.

SAW IT • • IT'S FASTER!

WITH Tannewitz METAL CUTTING BAND SAWS

Production increases of 50% to 100% in the cutting of sheet steel and non-ferrous metals—formed or flat—is the usual result of installing TANNEWITZ High Speed Metal Cutting Band Saws. The reason for this phenomenal production increase is due to the fact that these machines are precision built to provide better than two miles of vibrationless sawblade travel per minute and hence slide through the work with the greatest of ease. Many patented features put them entirely in a class by themselves. It'll pay you to get the complete facts. *Just ask for Metal Cutting Band Saw bulletin.*

KIND OF MATERIAL	Thicknesses and Speed for Sawing on Inches							
	1/32	1/16	1/8	1/4	1/2	1	2	3
Mild Steel	12-24	6	3	1				
Stainless Steel	6	2	1	.				
Yellow Brass, Zinc	24	12	6	3	1½	½	⅓	⅓
Bronze or Copper	6	3	1½	⅝	⅓	⅙		
Aluminum	24-36	18	9	4½	2	1½	1	⅔
Duraluminum	24	12	6	3	1½	1	⅔	⅓
Babbitt Pot Metal				6	4			
Babbitt Pot Metal				4	3			
Plywood	24-36	24	20	16	12	6	3	1½
Asbestos Board	12	6	3	1½	⅝			
Fibre (Hard)	24	12	6	⅓				
Paper Board	24	18	12	4	2	½		
Masonite	24	18	12	6	3	1½	¾	⅜
Bakelite	12	6	3	1½	⅝	⅓	⅙	

Other bulletins worth writing for: "SINGLE AND VARIABLE SPEED BAND SAWS FOR FOUNDRY USE"; "BAND SAWS FOR DIE-SAWING"; "INSIDE AND OUTSIDE FILING AND POLISHING".

THE TANNEWITZ WORKS, GRAND RAPIDS, MICH.

MILLHOLLAND

Automatic DRILLING - BORING MILLING - TAPPING Units

½ to 20 HORSEPOWER DRIVE

AUTOMATIC and SEMI-AUTOMATIC PRODUCTION MACHINERY

W. K. MILLHOLLAND MACHINERY CO.
Indianapolis, Ind.

LUCAS "PRECISION"

Horizontal Boring, Drilling and Milling Machine
THE LUCAS MACHINE TOOL CO.

NOW AND ALWAYS OF

CLEVELAND
OHIO, U. S. A.

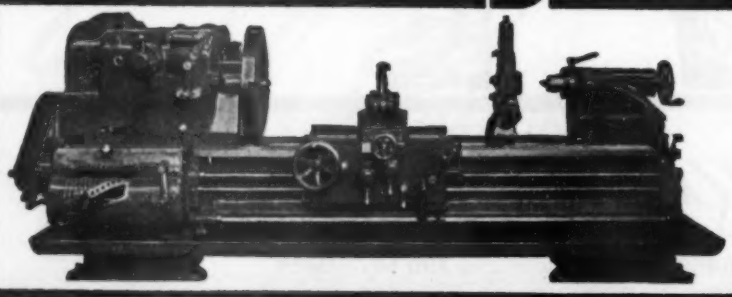
LELAND-GIFFORD COMPANY · MACHINE TOOLS · CRANK SHAFTS · WORCESTER MASS. U.S.A.

Drilling and Tapping Machines

(Automatic and Semi-Automatic)

LELAND GIFFORD CO.
WORCESTER, MASS.

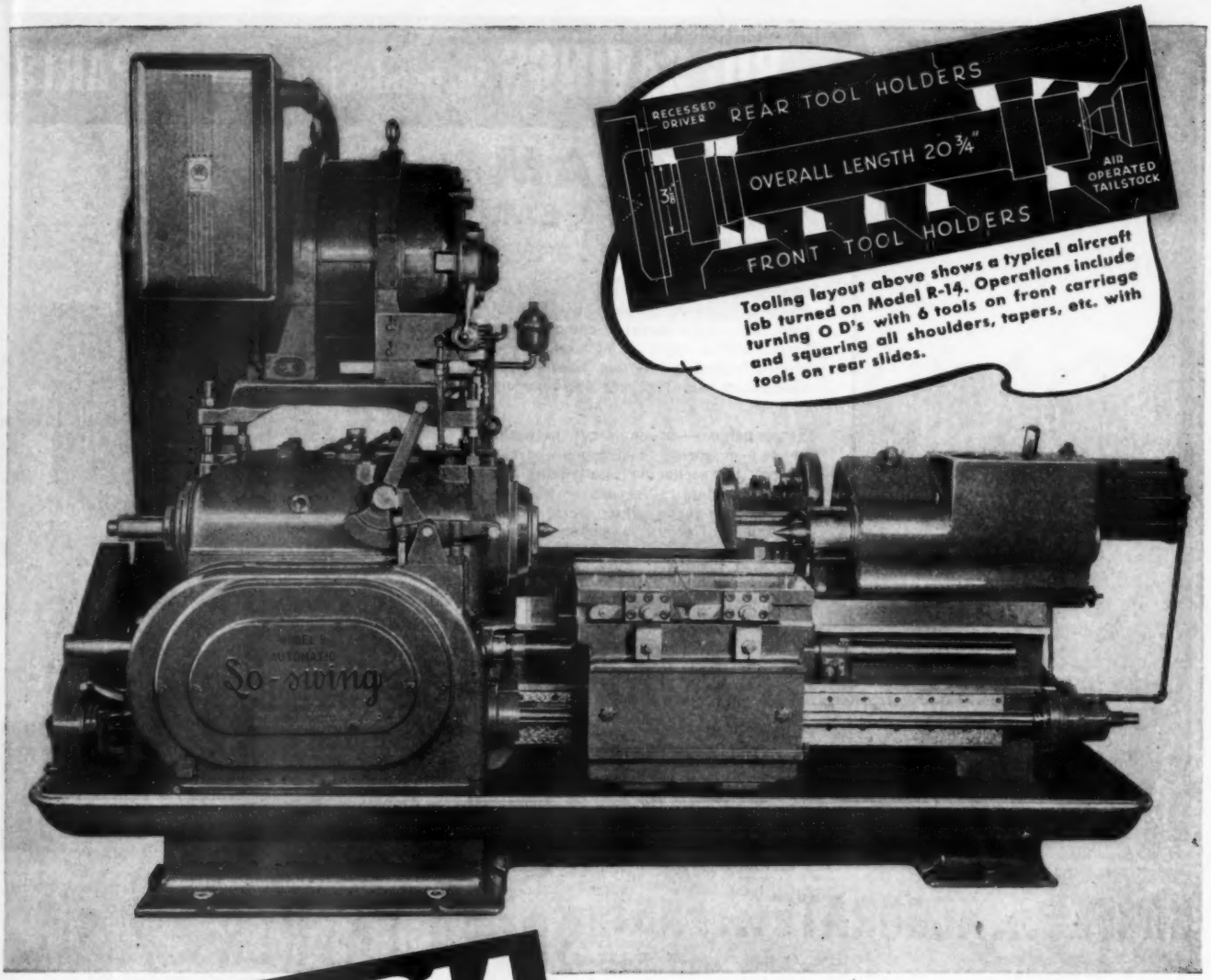
SPRINGFIELD GEARED HEAD LATHES



for peacetime or war production!

A lathe purchased now, for round-the-clock war production, must still meet peacetime requirements. Therefore, specify SPRINGFIELD lathes —flexible, efficient, ideal for emergency or normal production. SPRINGFIELD lathes are built in sizes from 14" to 30". Write for descriptive bulletins, prices, deliveries, etc.

The SPRINGFIELD MACHINE TOOL COMPANY • • • SPRINGFIELD, OHIO, U.S.A.


RECESSED DRIVER
REAR TOOL HOLDERS
OVERALL LENGTH 20¾"
3⅜"
AIR OPERATED TAILSTOCK
FRONT TOOL HOLDERS
Tooling layout above shows a typical aircraft job turned on Model R-14. Operations include turning O D's with 6 tools on front carriage and squaring all shoulders, tapers, etc. with tools on rear slides.
Lo-swing

MODEL Lo-swing R14

MAKING HISTORY ON AIRCRAFT PRODUCTION

● THIS BIG, powerful automatic lathe has set many records for low "per-piece" cost on aircraft motor cylinders, landing struts, tank, tractor and truck parts and other heavy war work. It incorporates the Seneca Falls Simplified Change-over Mechanism making it a practical machine for either short run or volume production. Length of carriage stroke and rapid traverse adjustment may be varied without changing any cams.

Positive operation, wide flexibility and servicing simplicity are important advantages of this design. Model R-14 may be equipped with a third arm (overhead) as well as additional back squaring attachments, carriages, carriage slides and work handling devices.

Write for condensed Catalog No. 42 showing the various types of Lo-swing production-boosting lathes.

SENECA FALLS MACHINE CO., SENECA FALLS, N. Y.

LATHE NEWS from SENECA FALLS

for BIG SAVINGS in producing SMALL PARTS

WALTHAM
PINION and GEAR CUTTERS . . . .

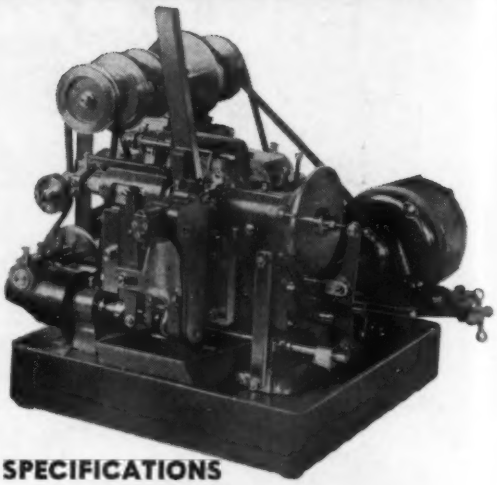
High production with maintained accuracy is assured through the use of these fast, easily operated, compact, machines. Skilled labor is not required—an outstanding advantage today when experienced operators may not be available.

These machines—in single-cut, multiple-cut and magazine feed types—have a capacity for producing small gears and pinions in quantity for use in watches, instruments, gages, fuses, etc. where precision is of utmost importance. Fully automatic operation is realized on magazine-feed machines. Cutters are available for Waltham and other machines.

Write at once for full details.

GEAR MACHINES

Pitch diameter, capacity 1½"
Strokes for work slide: .40", .63", 1.00", 1.25"



SPECIFICATIONS

PINION MACHINES

Diameter capacity (approx.)—½"
Coarsest pitch (about) 32 D.P.
Strokes of work slide for pinions .25" to .45"
Strokes of work slide for stacked gears .85" to 1"
Bench space (countershaft drive) 19" x 18"
Bench space (motor drive) 26" x 25"

WALTHAM MACHINE WORKS
WALTHAM, MASS.

SIMPLE...ACCURATE...FAST

. . . a machine that has won toolmakers' respect

Toolmakers, at a time like this, are faced with a succession of small yet important jobs which may easily tie up the shop. Under such conditions, machines of excess capacity may be used . . . which generally makes things worse. Small jobs should be scheduled for small machines that are quickly set up, easily changed over for a variety of work. Thus the little fussy jobs are "mowed down" fast and at low cost in man hours and money.

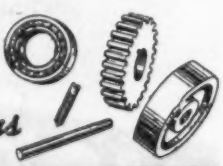
The Linley meets such emergencies with ease. Its 8 speeds from 275 to 4250 r.p.m. are more than adequate. The small floor area required (18½" x 20") is a distinct advantage where space is at a premium. Its rigidity, compact construction, velvet feed, "no backlash" quill, grease-sealed bearings, and lowest maintenance keep it in active service on a continuous succession of die work, model making, metal patterns, jig boring, milling, drilling, reaming . . . all general shop necessities.

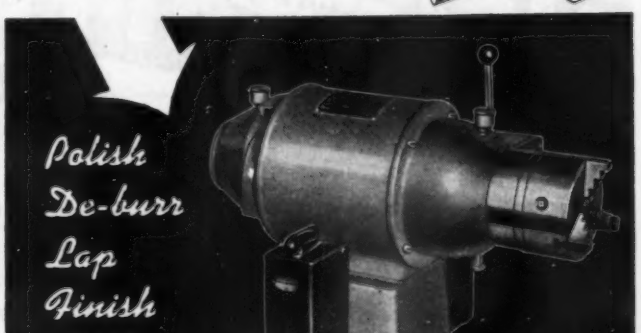
Table size of 7" x 17½", with plenty of clearance, gives reasonable capacity for many precision operations.

FULL DETAILS IN BULLETIN

LINLEY BROTHERS COMPANY
864 STATE ST. EXTENSION
BRIDGEPORT 1, CONN.

SPEED LATHES
for Secondary Operations





Schauer Ideal Speed Lathes insure finer quality, greater accuracy and uniformity, coupled with increased output and lower cost. A size and type for every finishing purpose. State YOUR finishing problem. Write for Catalog 440.

SCHAUER MACHINE COMPANY
ORIGINATORS OF TODAY'S SPEED LATHES
2867 READING ROAD — CINCINNATI 3, OHIO

★ ★

Hy-Draulic

DOUBLE-HOUSING PLANERS

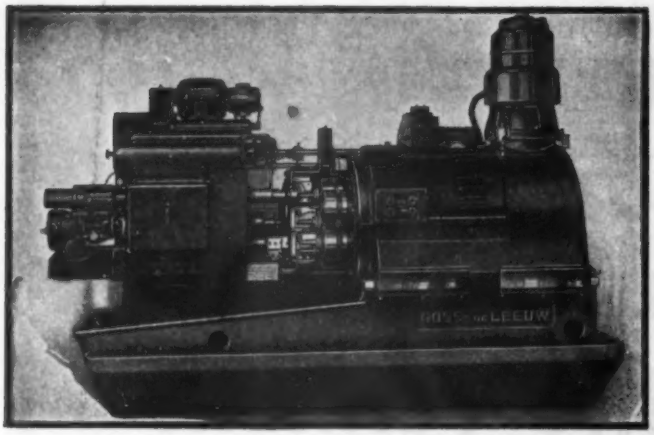
HAVE THE EXACT SPEEDS AND FEEDS YOU NEED FOR THAT WORK YOU WANT TO DO FAST

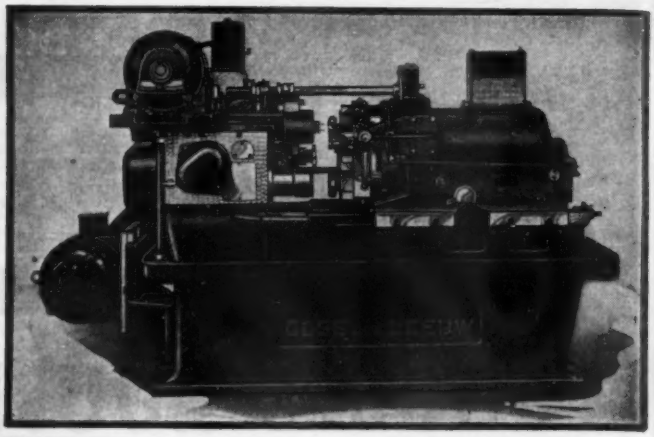
By turning a conveniently located hand-wheel, the operator of a Double-Housing Hy-Draulic Planer can get any feed-rate whatever in the specified range of the machine. Cutting speeds can be adjusted likewise at the hydraulic unit. Consequently it is easy for operators of Double-Housing Hy-Draulic Planers to get the *exact* combination of speed and feed needed for maximum production on each job.

Application of hy-draulic pressure to the table is smooth, direct and on a straight line parallel with the bed-ways. Cutting speed and pressure are maintained steadily throughout each chip, reversals are smooth, return-ratios high. There are no gears to shift in feed-changing; no rigid connections in table-drive to wear loose or transmit vibration, no costly special electrical equipment — the hydraulic driving unit takes a standard constant-speed electric motor. Double-Housing Hy-Draulic Planers are accurate, powerful, fast — guaranteed as to materials and workmanship. Write today for Bulletin 1112.

4405

ROCKFORD MACHINE TOOL CO., ROCKFORD, ILLINOIS





WORK ROTATING TYPE

5 Spindles
6 Spindles
8 Spindles

GOSS & DE LEEUW *Multiple Spindle* CHUCKING MACHINES

TOOL ROTATING TYPE

4 Spindles
5 Chucking Positions

On these machines, two threading operations can be handled simultaneously, each thread controlled by its own lead screw.

Among the many other modern features offered in both types are: pre-loaded anti-friction spindle bearings, hardened ways, oversize spindles and gears of chrome-nickel steel, heat-treated.

Complete details will be found in descriptive catalog available on request.

GOSS & DE LEEUW MACHINE CO., NEW BRITAIN, CONN.

LEACH External Grinder

PRICE
$875.00
Fully Equipped

Our dealers will help you fill out necessity priority forms.

Write us today for your nearest dealer's name and address.

Grinds Work from ¾" to 11" in length and from ⅛" to 7" in diameter.

Send for Descriptive Literature

EXCELLENT DELIVERIES

Exclusive Selling Agents

H. LEACH MACHINERY CO.

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DOUGLAS PRECISION MILLER

for Toolroom and Production

Size 32" x 8"
Plain

THE PRECISION BUILT INTO THE DOUGLAS MILLER

provides efficiency and speed to produce small parts requiring the extreme accuracy essential for war production.

Rigid well balanced design, combined with central control make for easy operation, permits the release of highly skilled labor for other tasks.

A wide selection of speeds meets all requirements for toolroom and production.

There is an ample variety of feeds from which to choose the right feed for material and accuracy requirements.

Timken bearings and helical drive gears are other features to assure a smooth performance. Write today for specifications and prices.

PROMPT DELIVERY

DOUGLAS MACHINERY CO., Inc.
156 BROADWAY • NEW YORK, N. Y.

Now 5 GRINDING SPINDLES FOR MAXIMUM OUTPUT

THE NEW HANCHETT

★ NO. 100 ★

SURFACE GRINDER

A high-speed, large-capacity, precision machine, designed to meet your present and future production plans. Takes five cuts — from rough to precision grinding in one pass — with automatic wheel-size control. Has 200 hp in grinding heads — five 40 hp motors, each driving 20" segmental wheel. Table is 100" in diameter, 20" wide. Approximate weight, 55,000 pounds. *Your inquiries are invited.*

WRITE TODAY for BULLETIN No. 144-4

HANCHETT GRINDERS — BIG RAPIDS MICHIGAN

IF IT'S A FLAT SURFACE—THERE'S A HANCHETT TO GRIND IT

HANCHETT MANUFACTURING CO.

BIG RAPIDS, MICHIGAN U.S.A.

BURKE MILLING MACHINES

. . . Put Your Small Work on a Production Basis!

Those small, difficult jobs can be handled on a *production basis* with BURKE Motor Driven Milling Machines Nos. 1, 2, 3, & 4. Primarily, this is because BURKES have been *specially designed and built* to do smaller milling jobs efficiently and economically.

Then, too, a number of attachments are available . . . attachments that increase the units usability, and add to your productivity. These include a vertical milling attachment, index centers, and vises—3 types, including swivel base. Now, when production must be stepped up, is the time to investigate the profit possibilities of BURKE Milling Machines, as applied to your work.

Complete Information Will Be Sent You Upon Request — Write!

BURKE MACHINE TOOL CO.
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GRAND Speed CLAMPS

QUIKCET . . . for Faster Production —Tighter Holding

Can be set in 4 seconds and released instantly. Ratchet set with side screw powerful fulcrum leverage tightening. 1-hand operation with absolutely non-creeping grip even on irregular surfaces. Setting the pace in war production everywhere.

Ask also about our complete line of Alloy-Steel "C" Clamps with *even greater than* forged clamp capacities, but cost less. Opening sizes up to 18" and proof test capacities up to 19,000 lbs.

Send for new 32-page Catalog

GRAND SPECIALTIES COMPANY
3100 WEST GRAND AVENUE, CHICAGO 22, ILLINOIS

How to apply the HORIZONTAL ROTO-MATIC for increased Drilling Production is described

in this

FREE BOOKLET

Learn how the Roto-Matic principle of continuous operation can be applied to your drilling, boring, reaming, facing, milling, etc., requirements and result in increased production. Write today for this booklet describing the many adaptations and advantages of the Roto-Matic.

Ask for Bulletin No. A-110.

Davis and Thompson Co.
Mfrs. of Machine Tools and Micrometers
6411 W. Burnham St. · Milwaukee 14, Wisconsin

Die-Making Machines

They save 50% on sawing, filing and lapping operations, easily maintaining .002" limits. Ask for special bulletin —also circulars on Drill pointers, Point Thinners, Mill cutter Grinders and Tap Grinders.

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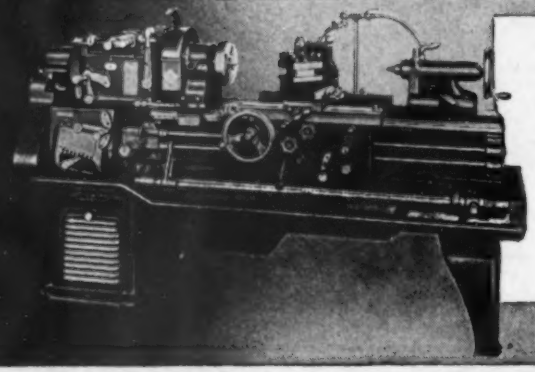
Oliver Instrument Co., 1414 Maumee St., Adrian, Mich.

For cutting internal keyways, slots or splines 1/16" to 4" wide and up to 60" long. Fast—Accurate—Flexible. Write for particulars and catalog on machine for your work.

Giant KEYSEATERS

MITTS & MERRILL
913 Tilden St.
Saginaw, Michigan

CINCINNATI LATHES



Inherently accurate on every job

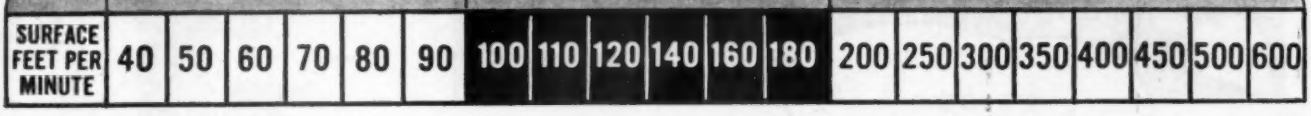
In every detail of design and construction, accuracy of these modern, convenient lathes assures precision performance. For example: gears are cut to closest tolerance, hardened and ground; spindle is mounted on roller bearings taking thrust in both directions; ways and carriage are hand scraped to closest precision. A massive bed construction provides strength and stiffness which contribute to overall accuracy on heavy cuts. Sizes from 14" to 30". Supplied with proper equipment for machining different size Shells.

THE CINCINNATI LATHE & TOOL CO.
Rogers Road, Oakley SPECIALISTS SINCE 1906 Cincinnati, Ohio

TANTUNG

THE MIRACLE TOOL METAL

FILLS THE GAP



GENERAL CUTTING RANGE

TANTUNG is a non-ferrous cast alloy that operates at highest efficiency between 100 and 200 surface feet per minute.

CUTS rolled, forged or cast steel, annealed or heat treated, cast iron, aluminum, brass, copper, bronze and any material that can be machined.

OPERATES at greater speeds, heavier cuts, heavier feeds than high-speed steel tools.

PRODUCES more pieces per grind and insures better finish than high-speed steel.

Tantung has an exceptionally high transverse rupture strength—is tough and shock resistant. It is the high red hardness of Tantung that enables it to work so efficiently under heavier loads. It is self-lubricating and due to its keen, durable cutting edge "cratering" or "chip wear" is reduced to a minimum. Detailed information regarding the use of Tantung is fully covered in the Tantung Catalog. Write for your copy today.

Ramet

VASCOLOY RAMET CORPORATION

CARBIDE TOOLS AND TANTUNG CAST ALLOY CUTTING TOOLS

NORTH CHICAGO, ILLINOIS

SALES AND SERVICE IN PRINCIPAL CITIES

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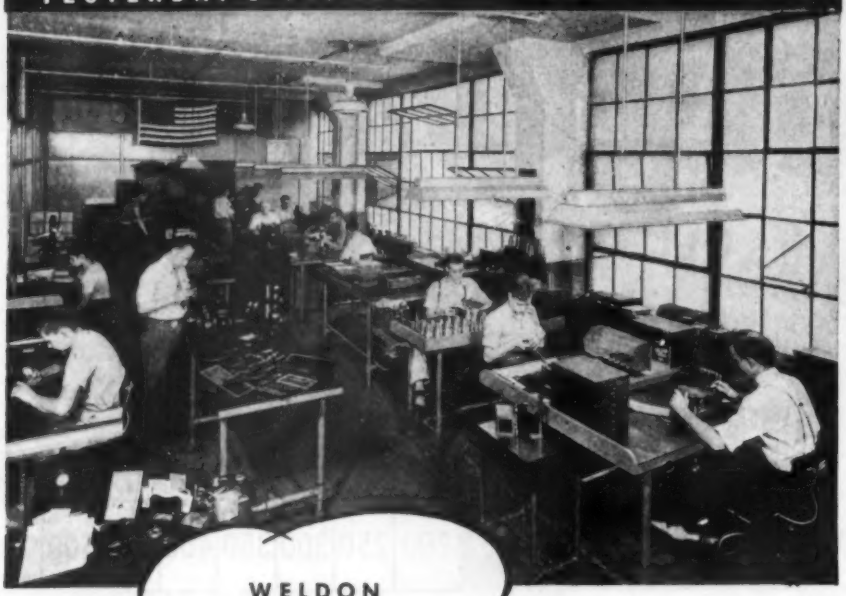
YESTERDAY'S PIONEER . . . TODAY'S LEADER



WELDON
INSPECTION
DEPARTMENT

INSPECTION *Safeguards* QUALITY

● Assured by high grade workmanship and finest materials, the quality of WELDON Tools is further safeguarded by a rigid policy of 100% inspection. Each end mill or special tool, for example, undergoes from 5 to 12 inspection operations. Included in the facilities of the Inspection Department is a temperature controlled "Standards Room" equipped with Optical Tools and Instruments, Pratt and Whitney Measuring Machine and Super-Micrometers, and Master Reference Gages.

Write for Catalog 8-B

THE WELDON TOOL CO. Cleveland 4, Ohio

3000 WOODHILL ROAD

NOW!
INDEX MILLS
EQUIPPED WITH
RODS & INDICATORS

"We are pleased to announce a rod and indicator set available for installation on Index Mills, either new at the factory, or used machines already in the field. Set consists of two indicators graduated in .0001" two micrometer heads graduated in .0001", necessary precision rods for locating in an area 8" x 16", and troughs for holding rods cross and longitudinal. This makes it possible for you to obtain, at an astonishingly low price, a precision locater as well as a vertical mill which has already proven its merits in the tool room and production line. Rod and indicator sets available for other machines also."

Mfd. by Index Machine & Tool Co.

PROMPT DELIVERY!

12" Tool Room Rotary Table

Mfd. by Index Machine & Tool Co.

A quality tool for precision work in the tool room or production line, incorporating such features as ball bearings—hardened and ground worm—quick acting throw-out for free hand turning—single movement table lock that does not cramp table out of alignment—compound trough. 12" size only.

For use on Index Mills or any other machine that will accommodate a 12" table.

BLANK and BUXTON MACHINERY

3100 E. MICHIGAN AVE.
JACKSON, MICH.

WETMORE adjustable blade REAMERS

For low cost precision holes...

and finer finish...faster

Wetmore type 7 shell reamer

• Wetmore shell reamers are modern tools—precision built for precision work. They have the exclusive Wetmore features that assure top production, finer finish and economy of long tool life. Wetmore shell reamers are available in sizes from 1-1/4" to 6" cutting diameters, with right or left hand angle blades in carbide or high speed steel.

When the job requires precision reaming, high production and low cost—it's an ideal job for Wetmore tools. That is why they are widely used in so many top-flight metal-working plants.

Send for this New Tool Guide—it is full of data, information and specifications . . . Free to executives and engineers.

Arbors for Wetmore shell reamers are available in straight or tapered shanks.

WETMORE REAMER CO.

410 No. 27th Street Milwaukee 8, Wis.

WETMORE REAMERS... BORING BARS

Check-List of Tools and Parts

made — and made better —

by MO-MAX

TRADE MARK REG. U.S. PAT. OFF.

HIGH SPEED STEEL

A glance down the lengthening list of tools and parts in which MO-MAX has been successfully used, emphasizes the opportunities that have re-opened now that this high speed steel is again available. You can now utilize the material that was first introduced, a new idea in basic composition — the first commercially successful molybdenum high speed steel.

With ten years of success behind it... established with tried, tested and proved performance... the basic composition of MO-MAX is as sound today as when it was first offered to the consumer.

Where toughness, and resistance to abrasion are essential... where outstanding machinability, particularly in grinding, is desired — investigate MO-MAX.

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- Broaches
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- Circular Forming Tools
- Circular Saws
- Cutters
- Dies for Hot and Cold Work
- Drills
- Drill Press Gears
- Flat Forming Tools
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- Metal Marking Stamps
- Milling Cutters
- Reamers
- Slitting Saws
- Spot Facers
- Taps
- Thread Chasers
- Thread Rolling Dies
- Tool Bits

Send the coupon for your copy of a newly revised question-answering technical data book.

THE CLEVELAND TWIST DRILL CO.
1242 East 49th Street, Cleveland 14, Ohio.

Please send me a copy of your new technical data book on MO-MAX High Speed Steel.

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Position_____

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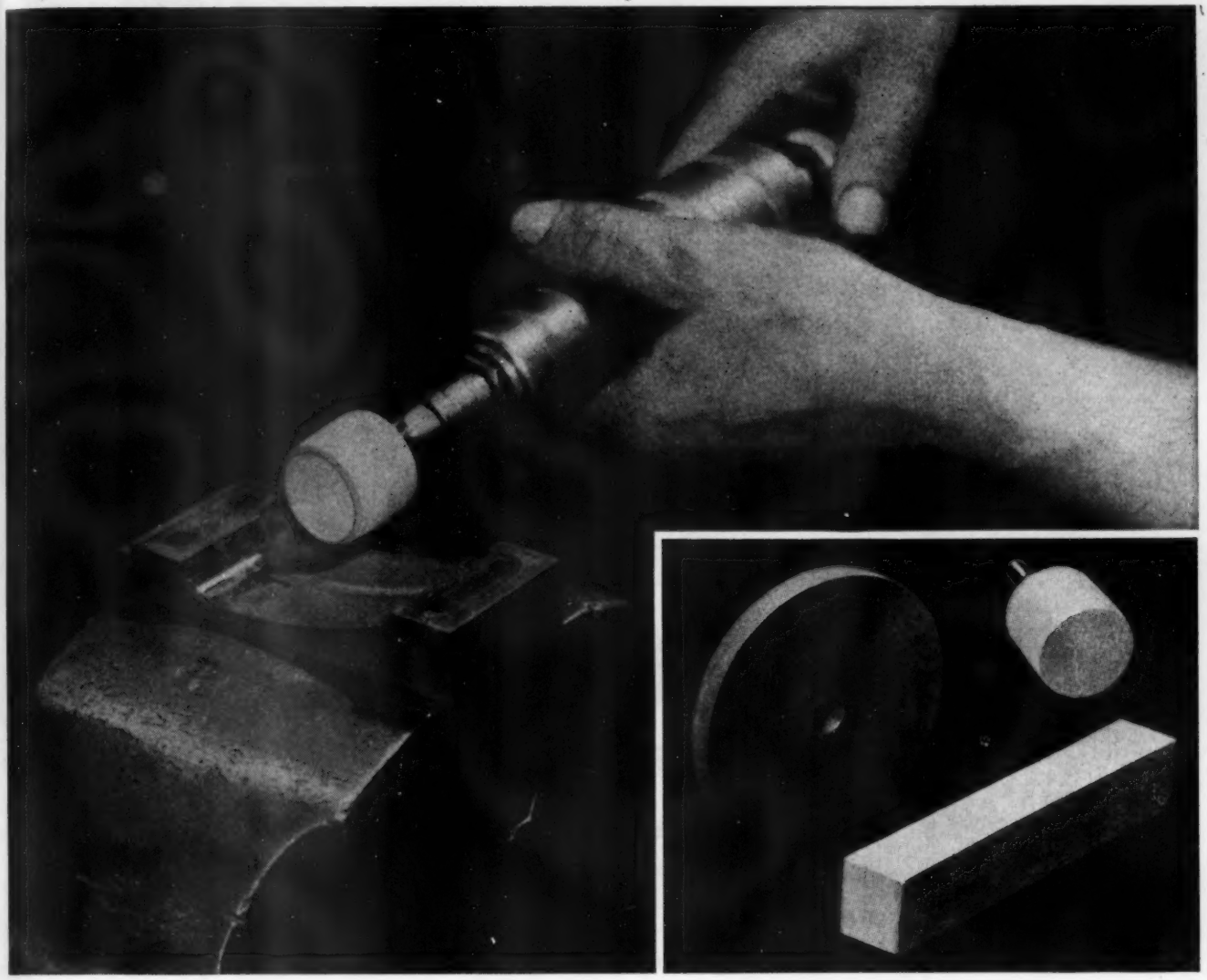
"Mohican"	Atlas Steels, Ltd.	"Rex-T-Mo"	Halcomb Steel Co.
"Bethlehem HM"	Bethlehem Steel Company	"Mogul"	Jessop Steel Company
"Mo-Cut"	Braeburn Alloy Steel Corp.	"Tatmo"	Latrobe Electric Steel Co.
"Star Max"	The Carpenter Steel Co.	"S. T. M."	Simonds Saw and Steel Co.
"Molite 8"	Columbia Tool Steel Company	"Mo-Tung"	Universal-Cyclops Steel Corp.
"Rex-T-Mo"	Crucible Steel Co. of America	"8-N-2"	Vanadium-Alloys Steel Co.
		"Vul-Mo"	Vulcan Crucible Steel Co.



Now a complete line "MX" WHEELS, MOUNTED WHEELS AND STICKS

On a great many jobs which call for finishing and polishing there are always many out-of-the-way-places—grooves, curves, angles and flat surfaces not readily accessible. To reach such places the "MX" Mounted Wheels, used on portable type machines, are proving to be the solution of this sometimes vexing problem.

"MX" Mounted Wheels have the same finishing and polishing action and the same characteristics as the straight "MX" Wheels. "MX" Wheels, both straight and mounted, are being used on such typical jobs as polishing out tool marks and scratches, cleaning out the channels of connecting rods, polishing and finishing the hard-to-get-at parts. For burring and polishing any complicated metal shapes, parts and castings. For finishing flutes between the cutting edges of broachers and reamers. For breaking down corners on miscellaneous parts.

NOTE: "MX" *Mounted* Wheels are made only in the straight shapes but they can be readily shaped or formed by the user to meet his finishing or polishing conditions. It is a simple matter to point, groove or round the wheels using a fine grit Carborundum Brand Silicon Carbide Stick as a dressing tool.

"MX" Sticks are particularly useful for breaking down edges and finishing work that can be turned in a lathe. They are also used with success for hand finishing molds and other such small, irregular surfaces.

"MX" Tools can save you time and improve the finish of your product. Send for "MX" Booklet which shows typical, successful, time-saving applications.
The Carborundum Company, Niagara Falls, N. Y.

CARBORUNDUM TRADE MARK
ABRASIVE PRODUCTS

"MX" Products by CARBORUNDUM

TRADE MARK TRADE MARK

Sales Offices and Warehouses in New York, Chicago, Philadelphia, Detroit, Cleveland, Boston, Pittsburgh, Cincinnati, Grand Rapids

(Carborundum and "MX" are registered trade marks of and indicate manufacture by The Carborundum Company)

. . . graduates of a tough school

GORHAM

HIGH SPEED STEEL GROUND TOOL BITS

Being recognized as "tops" in industry is scarcely a reputation to be achieved overnight . . . No, this versatile Gorham family of Ground Tool Bits came up the "hard way". And they're tough, worthy graduates of Gorham's long experience in the production of high quality bits and turning tools . . . They're products of Gorham's thorough knowledge of the CORRECT materials and treatment necessary to produce cutting materials for SPECIFIC JOBS . . .

That's why the Gorham family includes THREE distinctive members, to provide adequately for practically any application . . . If YOU have a tool bit problem, why not talk it over with Gorham?

3 DISTINCTIVE CUTTING MATERIALS

GORHAM STANDARD
For the commercial field

GORHAM M-40-B
For heavy cuts in hard material

GORHAM GORMET
For more abrasive materials

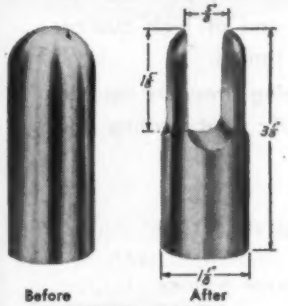
GORHAM TOOL COMPANY

14400 WOODROW WILSON AVENUE
DETROIT 3, MICHIGAN

Model 10-E)
t. Applied for

355 Aluminum parts milled in 1 HOUR!

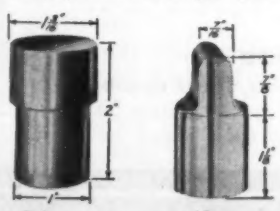
Milling of 10 parts simultaneously increases production 100-500%



Before After

ALUMINUM PARTS

These aluminum parts were milled upon the Aerco Multi-Grip Chuck at the rate of 355 per hour (floor to floor) as compared with single milling operations of only 71 per hour.



Before After

CHROME STEEL PARTS

These parts, high heat treated of Chrome-Moly, were produced at the rate of 62 per hour (floor to floor) on the Aerco Multi-Grip Chuck. Individual milling time was 15 per hour.

AERCO HYDRAULIC MULTI-GRIP CHUCK

check the operational features back of this record:

1. **A single loading for 10 parts:** new multi-grip chuck saves starting, stopping, cleaning fixture each time as with single-station units.
2. **No sacrifice of accuracy:** self-centering aligning collets insure perfect on-center milling regardless of slight shank diameter variations.
3. **Pressure built quickly:** hydraulic hand pump lever builds pressure up to 2500 p.s.i. with a few strokes.
4. **Quick re-loading:** self-opening collets are quickly re-loaded; adjustable depth stop for each collet eliminates necessity for gauges.
5. **Safe operation:** work is held rigidly in collets and cannot turn or be pulled out during milling operation. Safety stop prevents damage to collets should all stations not be filled.
6. **No waste milling motion:** Parts are held to minimum center distance eliminating cutting air — plus advantage of two rows which again doubles increased production.
7. **Variety of collet capacity:** #10-B chuck has round collet capacity from ⅛" to ½" inclusive. #10-E chuck has round collet capacity from ½" to 1¼" inclusive. Square and hexagon collets available for both chucks.

Representatives Wanted in Principal Cities

MANUFACTURED EXCLUSIVELY BY

AERCO CORP.

ARMY E NAVY

HOLLYDALE, CALIFORNIA

WRITE FOR NEW FOLDER

Vital for SUCCESSFUL INSPECTION

LOMBARD ANGLE PLATES

Rigidly supervised control of production gives you inspection equipment of unequalled precision within three tolerance ratings. Made from semi-steel type iron, close-grained and of high quality, they provide satisfactory service in three price ranges.

Long life accuracy and resistance to machining stress are assured through Lombard's special heavy ribbing, scientific heat treating and accurate finishing.

3 FINISHES AVAILABLE

Machine Finish — an Excellent Commercial Finish
Ground Finish — for Closer Tolerances
Hand-Scraped Finish — Finest Finish for Extreme Accuracy

OTHER LOMBARD PRECISION EQUIPMENT

Ground Bench Plates
Surface Plates
Lapping Plates
Box Parallels
Solid Parallels
Straight Edges
Hardened and Ground V-Blocks

Send for catalog of LOMBARD PRECISION EQUIPMENT

SURFACE PLATES RECONDITIONED

Careful scraping of worn surface plates puts them back into perfect condition for added years of service. Prompt service assured.

ARMY (E) NAVY

LG LOMBARD *Governor* CORPORATION

ASHLAND · MASSACHUSETTS

The Battle of Bearings

EVERY UNIT of modern war equipment either rolls on anti-friction bearings, or is produced on machines provided with anti-friction bearings.

That is why our planes are smashing Nazi bearing factories—and why America's bearing plants are battling against time to turn out the millions of anti-friction bearings needed for the huge U. S. war machine.

. . . 3400 anti-friction bearing assemblies are built into every Flying Fortress.

. . . 160 anti-friction bearing assemblies are needed for every Long Tom gun and its prime mover.

. . . 97 anti-friction bearing assemblies are required for every M-4 tank.

Gulf is proud of the part that Gulf products are playing in the precision manufacture of anti-friction bearings in twenty of America's leading bearing plants. Gulf's staff of trained service engineers consults regularly with the production and maintenance personnel of these plants, helping to insure efficient, dependable operation of equipment on 168-hour weekly schedules, maximum production of bearing parts, and long tool life.

If you have a problem in any way connected with the use of a petroleum product, Gulf is well prepared to give you effective help in its solution. Write, wire, or phone your nearest Gulf office today.

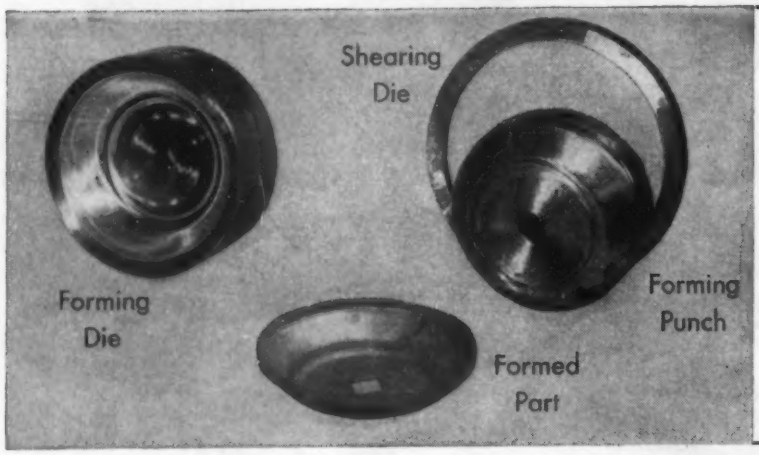
GULF INDUSTRIAL LUBRICATION

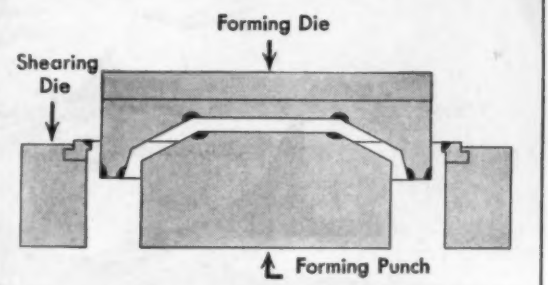
Gulf Oil Corporation · Gulf Refining Company · Gulf Building, Pittsburgh 30, Pa.

BACK THE ATTACK . . . BUY MORE WAR BONDS!

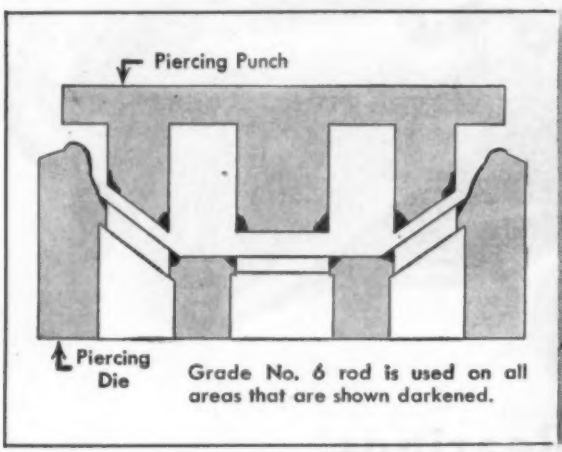
Hard-Facing saves $2,500 on these Truck Wheel Dies

. . . and they last 3 times as long

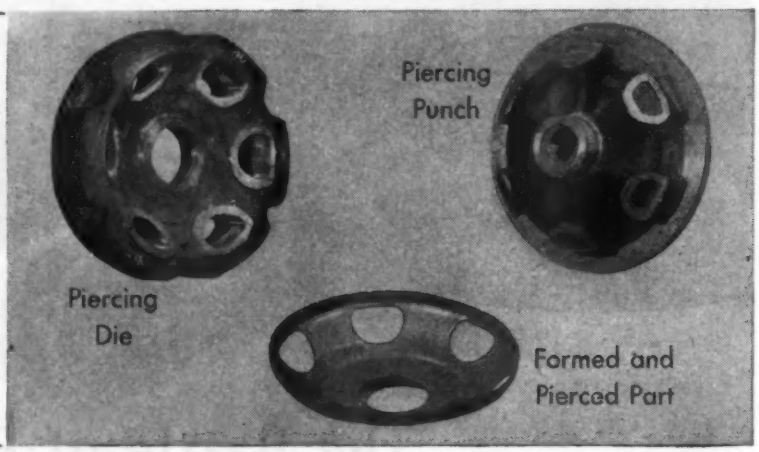




The darkened areas show where the HAYNES STELLITE rod deposits are made. Grade No. 6 rod is used at all points except on the punch. On the punch No. 12 rod is used.



Grade No. 6 rod is used on all areas that are shown darkened.



The old way cost $4,300. Formerly these two sets of dies for making truck wheels were fabricated of special steels. They produced only 15,000 blanks.

The new way costs $1,800. By making these dies of carbon steels and hard-facing working surfaces with HAYNES STELLITE rods a saving of $2,500 is realized in initial costs. In addition, these hard-faced dies turn out 50,000 pieces.

Hard-facing with HAYNES STELLITE rods is an economical way of increasing life in tools, dies, and many other metal parts subjected to extreme wear and abrasion. You can get more information about hard-facing and how to do it by writing for the booklet "Hard-Facing With HAYNES STELLITE Products."

HAYNES STELLITE TRADE-MARK

HAYNES STELLITE COMPANY

Unit of Union Carbide and Carbon Corporation

New York 17, N. Y. UCC Kokomo, Ind.

Chicago—Cleveland—Detroit—Houston—Los Angeles—San Francisco—Tulsa

HARD-FACING RODS FOR EVERY PURPOSE

"Haynes Stellite" is a registered trade-mark of Haynes Stellite Company.

P15967

'here won't be any

Sharp line drawn

WAR industries are too big to stop at a common finish line. Peace industries are too big to resume at a common starting line.

There may be months of overlapping schedules even in a single plant! Certainly no single V Day for all manufacturers together.

When you reconvert it will be your decision —what you will make, and *when* you will make it.

But it may be our privilege to help you with the HOW. And what is more vital, to help you answer the question, "How much will it cost?"

Here are several National Acme Publications designed to help you produce *more for less.*

Write us—on your company letterhead—for any of them.

BULLETIN CM-43
"Multiple Spindle Chucking Automatics"

BULLETIN CM-44
"How Costs Were Cut on 25 Chucking Jobs"

CATALOG D-42-B
Automatic Dies, Collapsible Taps and Hollow Mill Heads

Other Publications on Multiple Spindle Bar Automatics, Snap-Lock Limit, Motor Starter and Station Control Switches, Solenoids, Centrifuges.

THE NATIONAL ACME CO.

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ACME-GRIDLEY 4-6 AND 8 SPINDLE BAR AND CHUCKING AUTOMATICS • SINGLE SPINDLE AUTOMATICS • AUTOMATIC THREADING DIES AND TAPS • THE CHRONOLOG • LIMIT AND CONTROL STATION SWITCHES • SOLENOIDS • CENTRIFUGES • CONTRACT MANUFACTURING

Photo—Courtesy Aviation Ma

SETTING STUDS IN AIRCRAFT ENGINES with MODERN SELF-OPENING STUD SETTERS

Many aircraft engine builders are setting studs by the slow and costly hand method and have kept away from setting studs by power.

●

Packard are now using power and the Modern Stud Setter for driving 1/4" and 5/16" — studs in the upper crankcase of the Packard Rolls Royce Engine, which results in great saving in the cost of driving studs.

●

Full information on the Modern Stud Setter will be sent on request.

MODERN TOOL WORKS

DIVISION OF

CONSOLIDATED MACHINE TOOL CORPORATION

ROCHESTER 10, NEW YORK

SAFER! ...POSITIVE UNBREAKABLE CONNECTION

TO CONNECT, place ends together, push and twist —they're locked.
TO DISCONNECT, simply pull back sleeves . . .
jaws open automatically.

Thor "PERFECT" AIR HOSE COUPLINGS

Positively locked connection that won't break or come apart.
Greater safety — couplings cannot separate even if one lock becomes caught on something.
Truly universal—no right or left, male or female hose ends. Interchangeable in all sizes to ¾".
Longer life — they're made of alloy steel, heat treated for extra durability; specially processed to prevent rusting.
Quicker operation—disconnect by a simple pull on sleeves; connect by a straight push and slight twist.

EXCLUSIVE DESIGN ASSURES POSITIVE-LOCK CONNECTION

Job-proved tests every day in scores of shops are demonstrating the *greater safety* of Thor "Perfect" Air Hose Couplings.

The ingenious, simple design of Thor Air Hose Couplings provides a positive, unbreakable connection . . . yet one that can be locked and unlocked quickly.

Thor "Perfect" Air Hose Couplings, stocked and sold by leading mill, marine and foundry supply distributors everywhere, can help you do countless air tool jobs *faster . . . safer!* Fill out the coupon below and ask for a demonstration *today.*

Thor *Portable Pneumatic and Electric Tools*

INDEPENDENT PNEUMATIC TOOL COMPANY

600 W. JACKSON BOULEVARD, CHICAGO 6, ILL.

Branches in Principal Cities

INDEPENDENT PNEUMATIC TOOL CO.
600 West Jackson Blvd., Chicago 6, Ill.

Gentlemen:
Please arrange to have your representative call for a demonstration of Thor "Perfect" Air Hose Couplings.

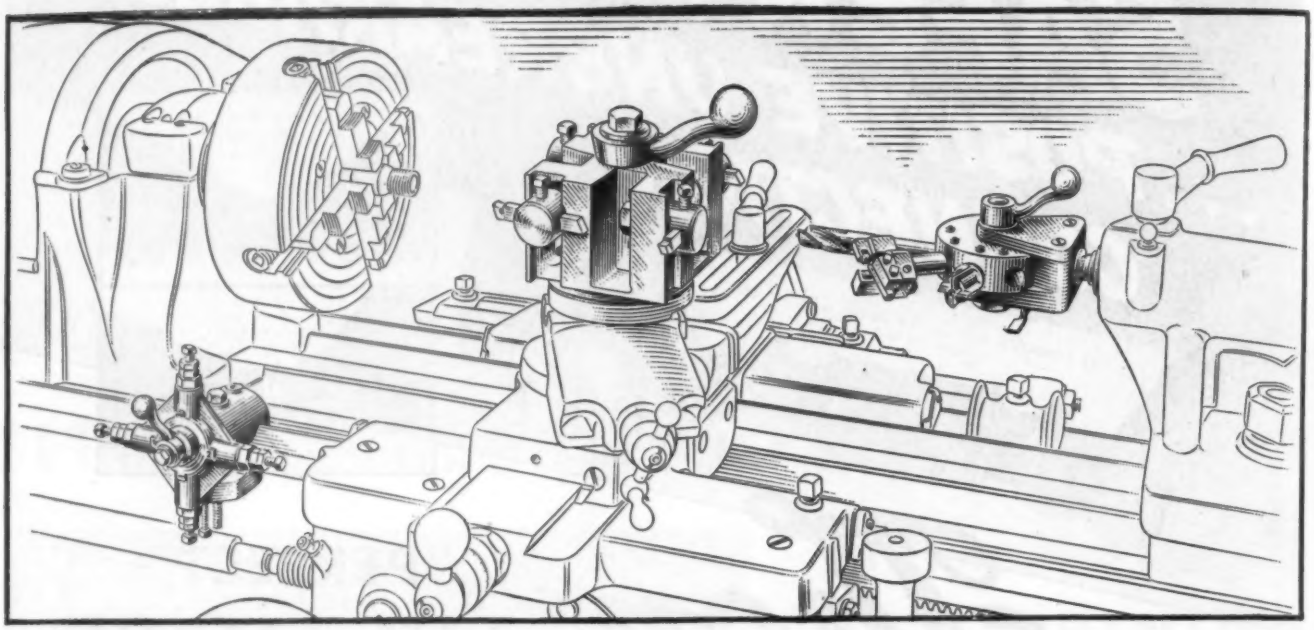
NAME.....

COMPANY.....

ADDRESS.....

CITY.....STATE.....

To convert engine lathes into turret lathes...



Here's all you need...

CROSS-SLIDE TURRET — for multiple machining operations on the same lathe. Gives you four different working positions without tool changes. No. 30 for 9" to 12" lathes; No. 60 for 13" to 20" lathes.

TAIL-STOCK TURRET— quickly converts engine lathe into 4-way turret lathe for end work. No. 58 with No. 2 Morse Taper Shank; No. 103 with No. 3 Morse Taper Shank; No. 104 with No. 4 Morse Taper Shank.

LATHE STOP—you measure only once for each operation, thus saving valuable time. Once the four measuring positions are set, you just index. No. 10 for 9" to 12" lathes; No. 20 for 13" to 20" lathes.

With these three SPECIALTIES lathe accessories attached to your engine lathe, you can do any kind of work—forming, roughing, boring, finishing, drilling, tapping—without stopping the lathe or changing tools.

A SPECIALTIES Cross-Slide Turret, Tailstock Turret and Lathe Stop convert any engine lathe into a complete, accurate turret lathe, multiplying the productive capacity of your machine many times.

See for yourself how easily, and quickly, you can take advantage of this SPECIALTIES production team designed to speed output of vital war material, increase efficiency, and cut machining costs. Mail the coupon for full details.

SPECIALTIES Manufacturing Co., Inc.
46 Farrand Street, Bloomfield, N. J.

Please send me full information on SPECIALTIES lathe accessories.

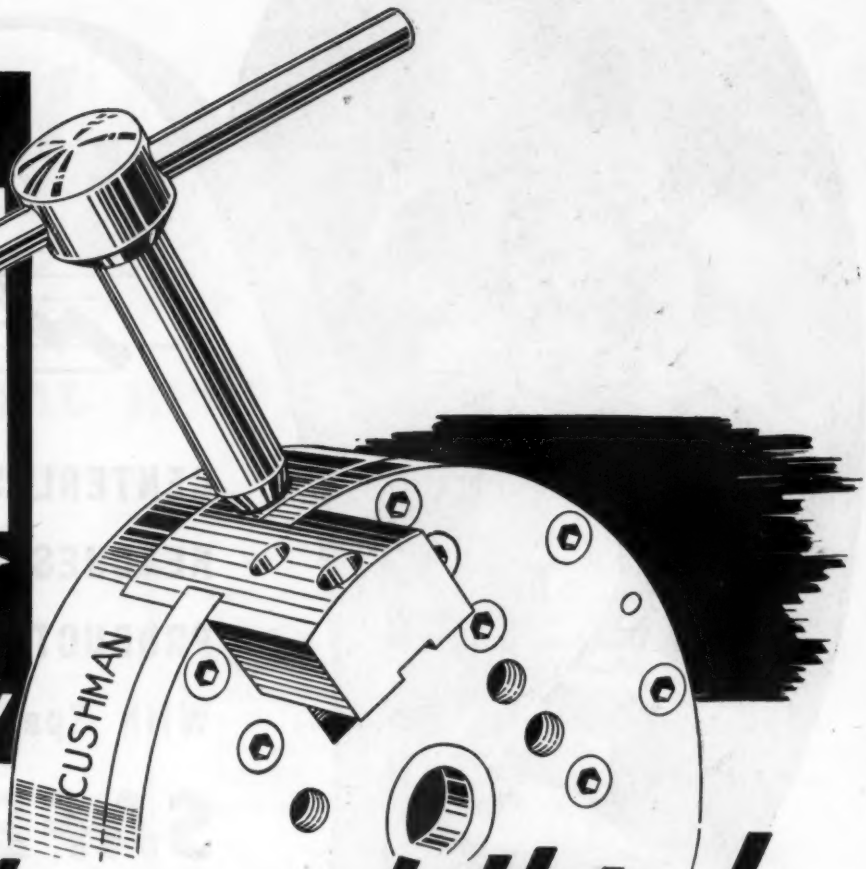
Name_____

Company_____

Address_____

City_____ State_____

SPECIALTIES
MANUFACTURING COMPANY, Inc.

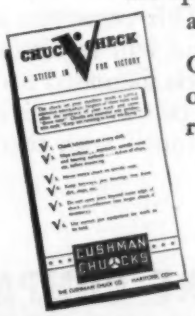


Stop and think...

WHEN YOU USE THAT wrench!

● A wrench is a good symbol for industry today. We've got our enemies where we can really begin to apply the squeeze. But when a machine tool operator puts the wrench to his chucks he should not only think of the direct contribution he is making to Victory but should also bear in mind that the chucking equipment he is operating must be carefully conserved and maintained as a vital part of our war production facilities.

We build a high degree of precision into Cushman Chucks and they are capable of rendering long, trouble-free service. But, like any other fine tools, they require careful handling and intelligent maintenance. They should be selected, in the first place, for the specific job they are to perform. They should be regularly lubricated, kept clean and not subjected to overload or abuse.



Cushman Chuck Check Cards . . . available free to you for distribution to your operators . . . will help you conserve these important tools, prevent delays and reduce spoilage. Write to The Cushman Chuck Co., Hartford 1, Conn., U. S. A.

A WORLD STANDARD FOR PRECISION

CUSHMAN CHUCKS

CENTERLESS GRINDING REACHES NEW PRODUCTION HIGH With Special SAFETY GRINDING WHEELS

It's a fact that when SAFETY Grinding Wheels are used for centerless grinding, mass production of intricate parts for war and other instruments is made more practical and economical.

And the reason is that there's a SAFETY Wheel exactly fitted for the job it is intended to do. In this connection, remember that SAFETY specifications are absolutely reliable and dependable, an important factor when grit, porosity and grade of hardness are prime considerations in the centerless grinding of a particular part. The uniformity of SAFETY Centerless Grinding Wheels and years of experimentation in this particular field bring the user the highest quality product and the assurance that war-time production schedules can be maintained.

SAFETY Grinding Wheel Service

If you desire the most efficient centerless grinding set-up for your plant, consult with SAFETY Grinding Wheel Engineers. This costs you nothing, involves no obligation, and will result in giving your plant's grinding wheels increased production. Any of the offices listed below will give you prompt action if you get in touch with them, or with our factory direct.

THE SAFETY GRINDING WHEEL AND MACHINE COMPANY

MAIN OFFICE AND FACTORY SPRINGFIELD, OHIO, PHONE 4651

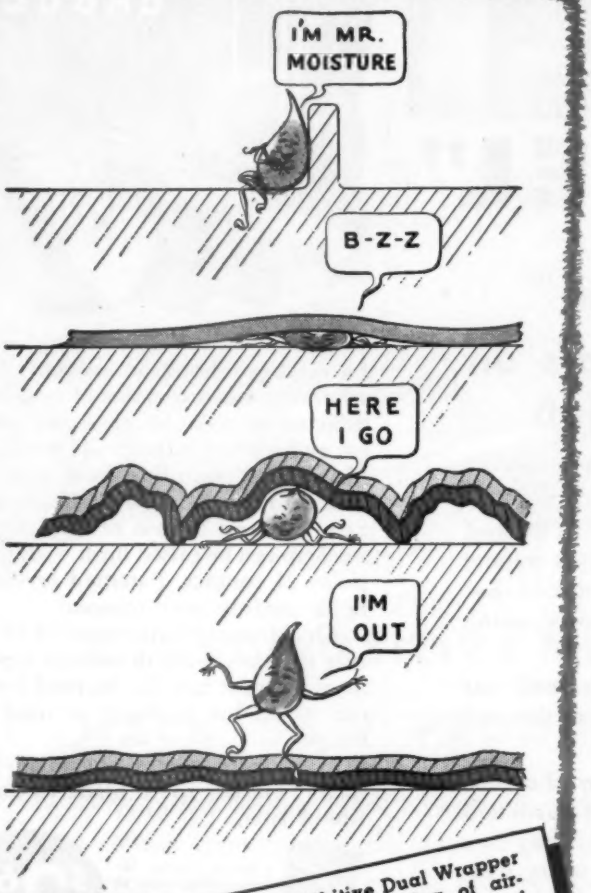
● SALES OFFICE ★ SALES OFFICE and WAREHOUSE

● Birmingham—3-3323 ★ Chicago—TRiangle 8308 ★ Cleveland—EXpress 1445 ★ Detroit—TOwnsend 8-4740
★ Pittsburgh—COurt 2822 ★ Erie—23-093 ★ Philadelphia—WAlnut 3132 ★ St. Louis—CEntral 3676
● Birmingham—3-3323 ★ Chicago—TRiangle 8308 ★ Cleveland—EXpress 1445

Induwrap*

GIVES ARTIFICIAL RESPIRATION TO STEEL

..kills corrosion



INDUWRAP — This Inhibitive Dual Wrapper has revolutionized the packaging of airplane engine and other highly finished metal parts shipped to points throughout the world.

WRITE TODAY for sample and free descriptive folder. "The Touch of Death to Steel" — Folder (AM). Anticipate your peacetime needs when ANGIER INDUWRAP will be generally available to industry.

Who would have thought it — highly finished steel needing to breathe!

But it does. At any rate, that's the theory of Angier Protective Engineers and other competent packing authorities. Experiments have found a way to let packaged steel breathe, and many tests have demonstrated that breathing, as permitted by INDUWRAP, is an effective first-aid against the contamination of steel by corrosion.

Let's see how Mr. Moisture makes it work:

Under a tight-fitting flat wrap, Mr. Moisture is squashed against the steel surface — trapped there on a spot where the protective oil film may be broken. Corrosion starts its deadly work.

But note how different it is when the wrapper is creped — when it S-T-R-E-T-C-H-E-S. In the little air channels between points where it touches the steel, Mr. Moisture finds elbow room to wiggle out — evaporate from his prison, leaving the broken "spot" in the oil film protected by the A-25 infusing compound in the INDUWRAP wrapper.

"What is the source of this moisture?" you may ask. Well, it may fight its way out of pores in the metal, or come from solvents in the oil compound with which the metal is slushed. It may make its unwelcome appearance from many places, and it does. INDUWRAP — creped and with its corrosion inhibitive metal-contacting surface — is safe insurance against this trouble-maker.

Then there are other decided advantages in using a creped, resilient wrapper. It is flexible and conforms neatly to the protruding parts of odd-shaped articles, without puncturing or tearing. And it helps to cushion the shocks of travel.

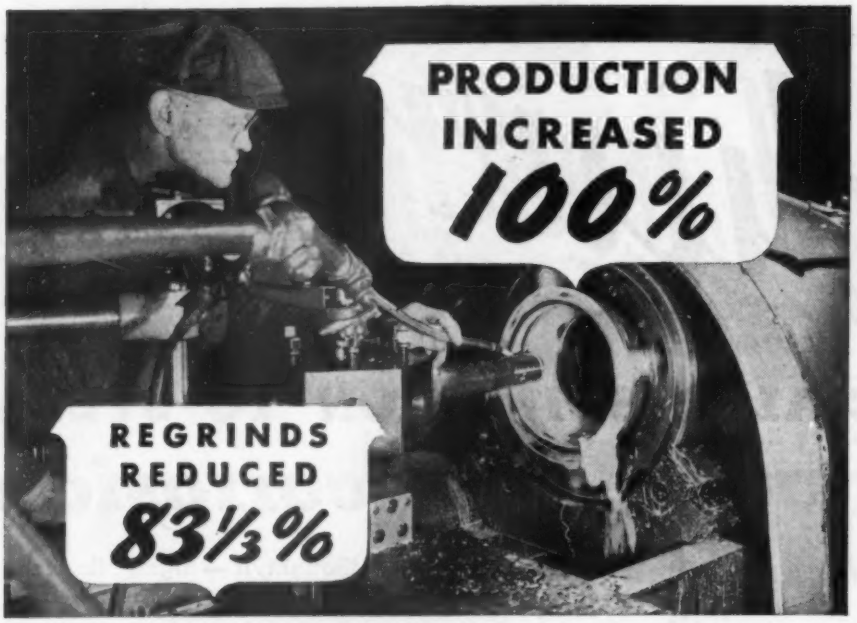
*REG. U. S. PAT. OFF.

ANGIER CORPORATION

CORROSION PREVENTIVE AND WATERPROOF PAPERS

FRAMINGHAM, MASSACHUSETTS

Angier



"HARDSTEEL" TOOL BITS

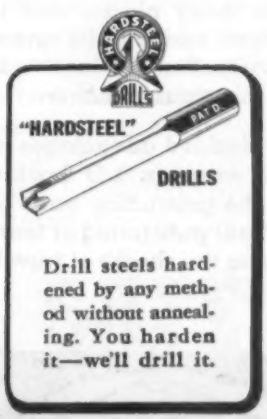
Outperformed all other tools on this difficult machining job

Many plants have reported the outstanding performance of "HARDSTEEL" tool bits—the following is typical.

Production of aerial torpedo tail cones from SAE 3150 steel forgings bored on a 96-inch lathe running at 126 ft. per minute and taking a .250 in. cut at .012 in. per rev. feed was three a day. Seven cuts were required,—with 3 regrinds per piece, using a high grade tool.

After changing to "HARDSTEEL" tool bits the feed was doubled to .025 in. per rev.—regrinds were cut to 3 per day and output increased to six tail cones per day.

"HARDSTEEL" tool bits are cast from a special alloy, the same material that enables "HARDSTEEL" drills to drill hardened steels without annealing. They are economical on tough, hard steels, scale covered forgings and the tough, abrasive copper and light metal alloys.



Drill steels hardened by any method without annealing. You harden it—we'll drill it.

Let "HARDSTEEL" help you turn out more work at lower cost. Outline your tool problems—or ask for a copy of the "HARDSTEEL" Operators Manual.

BLACK DRILL COMPANY
Division of
BLACK INDUSTRIES
1400 East 222nd Street • Cleveland 17, Ohio

"HARDSTEEL"
DRILLS · TOOL BITS · SPECIAL TOOLS

NO. 5 IN A SERIES

USE IT AS A HEIGHT GAUGE

In machine shops, on assembly lines, wherever measurements of height are difficult to make because of crowded or awkward position of work, the MASTER Streamline steel tape rule is easy to handle . . . unfailingly accurate. Flat end of case acts as base and steel tip can be raised flush with upper point of contact. Patented lever-lock holds reading until released.

This strongly constructed MASTER rule is in wide use in various types of measuring; it can also be used for lay-out work, for scribing, or used as a caliper.

Every rule comes equipped with easily inserted spare blade to double life of rule.

Write today for your free copy of this new 16-page pocket sized manual "Rules for Measurement."

$2.65 each complete with spare blade

MASTER
WOOD AND TAPE RULES

MASTER RULE MFG. CO., INC., Dept. P-7
815 E. 136th St., New York 54, N. Y.

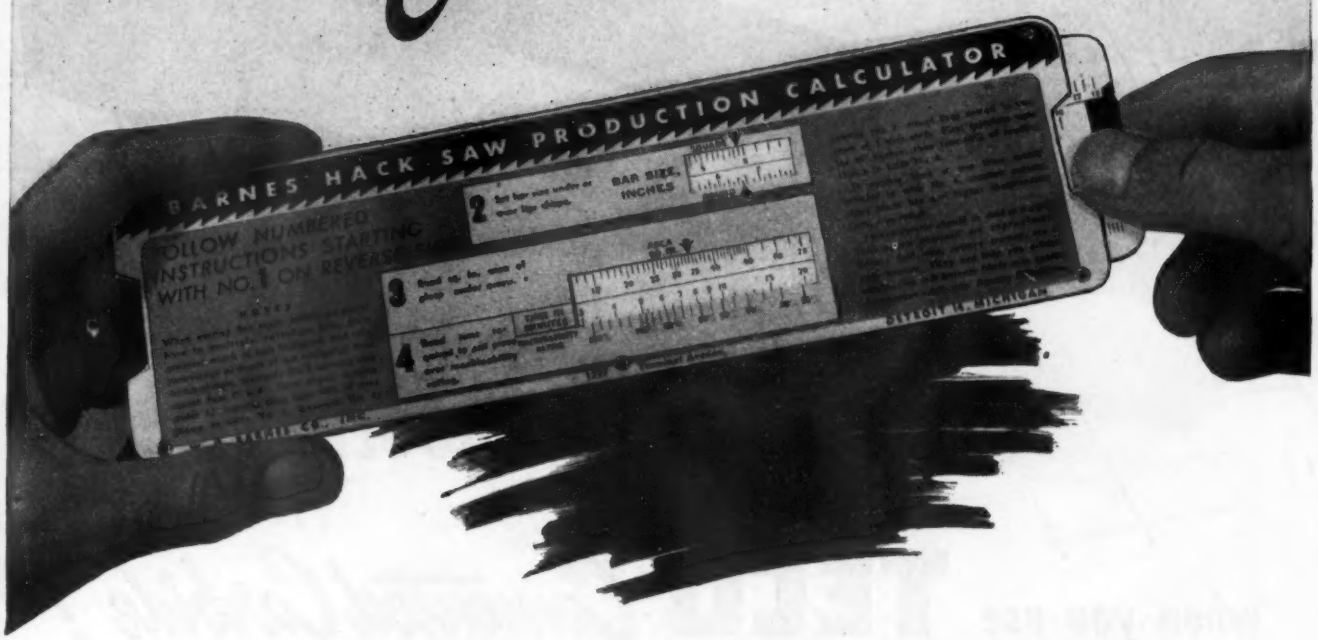
Enclosed please find $2.65 for 6 ft. "Streamline" steel tape rule and spare blade.

Name_____

Address_____

City_____ State_____

In the Hands of HACK SAW USERS *Everywhere!*


BARNES HACK SAW PRODUCTION CALCULATOR
FOLLOW NUMBERED INSTRUCTIONS STARTING WITH NO. 1 ON REVERSE SIDE
BAR SIZE, INCHES

A FAST, POSITIVE METHOD OF ESTIMATING HACK SAW PRODUCTION . .

With the Barnes Hack Saw Production Calculator, you can estimate immediately the time required to cut almost any ferrous or non-ferrous metal. It serves as a guide to keep the cutting speed of any power hack saw machine within limits which will eliminate crooked cutting, short blade life or high maintenance costs.

If you are a user of hack saws, you will find this Calculator invaluable. Write for yours today . . . there is no cost or obligation.

FACTORY TRAINED BARNES SERVICE ENGINEERS

. . . offer experience and ability to solve many metal cutting problems. Their services are at your disposal. Ask any Barnes Distributor.

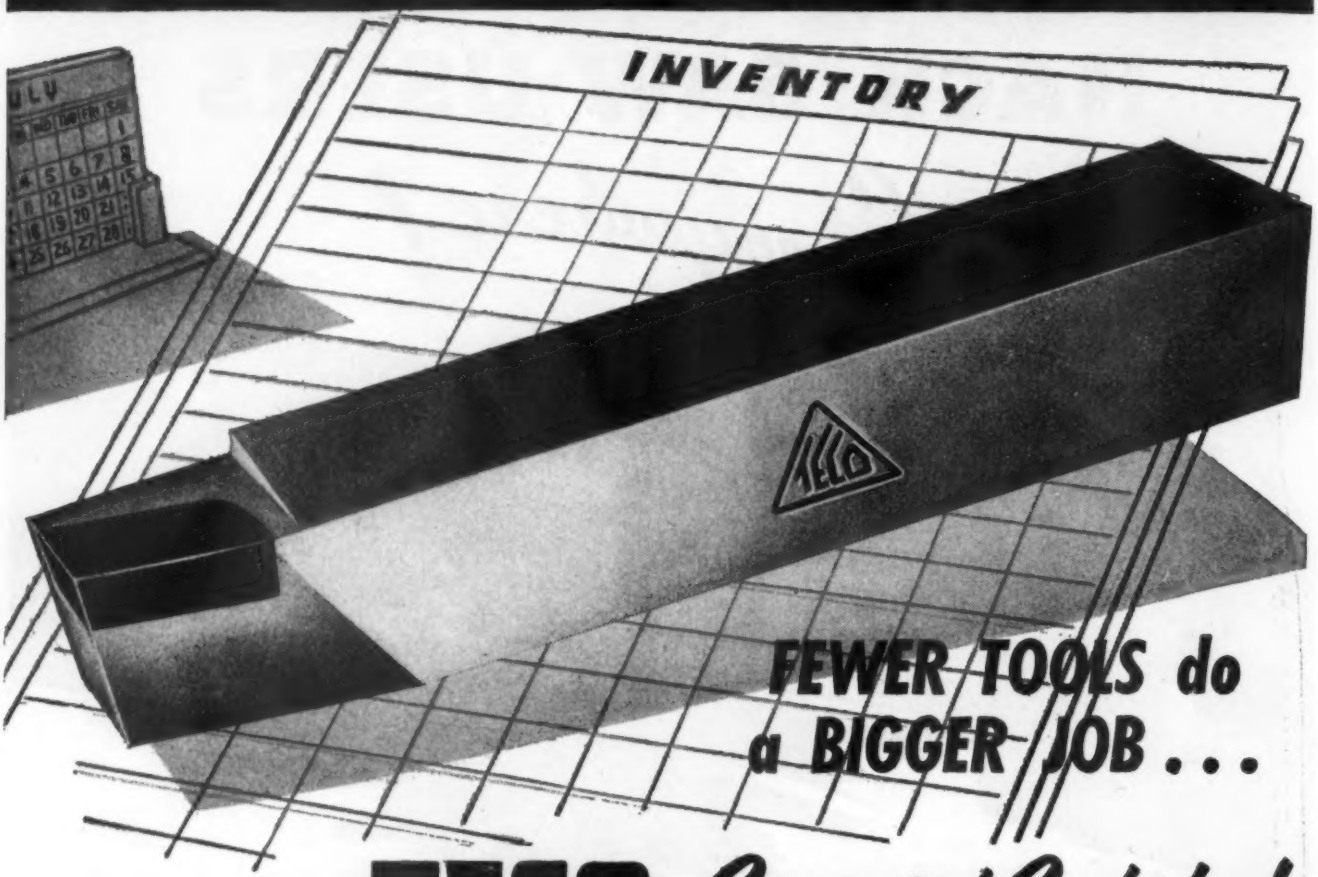
W. O. BARNES CO., INC.

DETROIT 14, MICHIGAN

1919 - 1944

o TWENTY-FIFTH ANNIVERSARY o

HOLD DOWN TOOL INVENTORIES!



FEWER TOOLS do a BIGGER JOB . . .

when you use TECO *Cemented Carbide!*

There is so much more production in each TECO Cemented Carbide tool, you need fewer tools to maintain peak production. TECO Cemented Carbide stays on the job longer — produces more pieces — because it has extraordinary resistance to wear and breakage.

This is no mere claim, but a fact proved in the country's foremost metal-working plants. And the reason is found in the harder, denser, more uniform structure of TECO Cemented Carbide — achieved through long "know-how" and rigid manufacturing control.

Conveniently located representatives are glad to show you how TECO Cemented Carbide can increase your production, at lower tool cost. Write for catalog and new price list covering tools and blanks in sizes, grades and styles for practically all machining needs.

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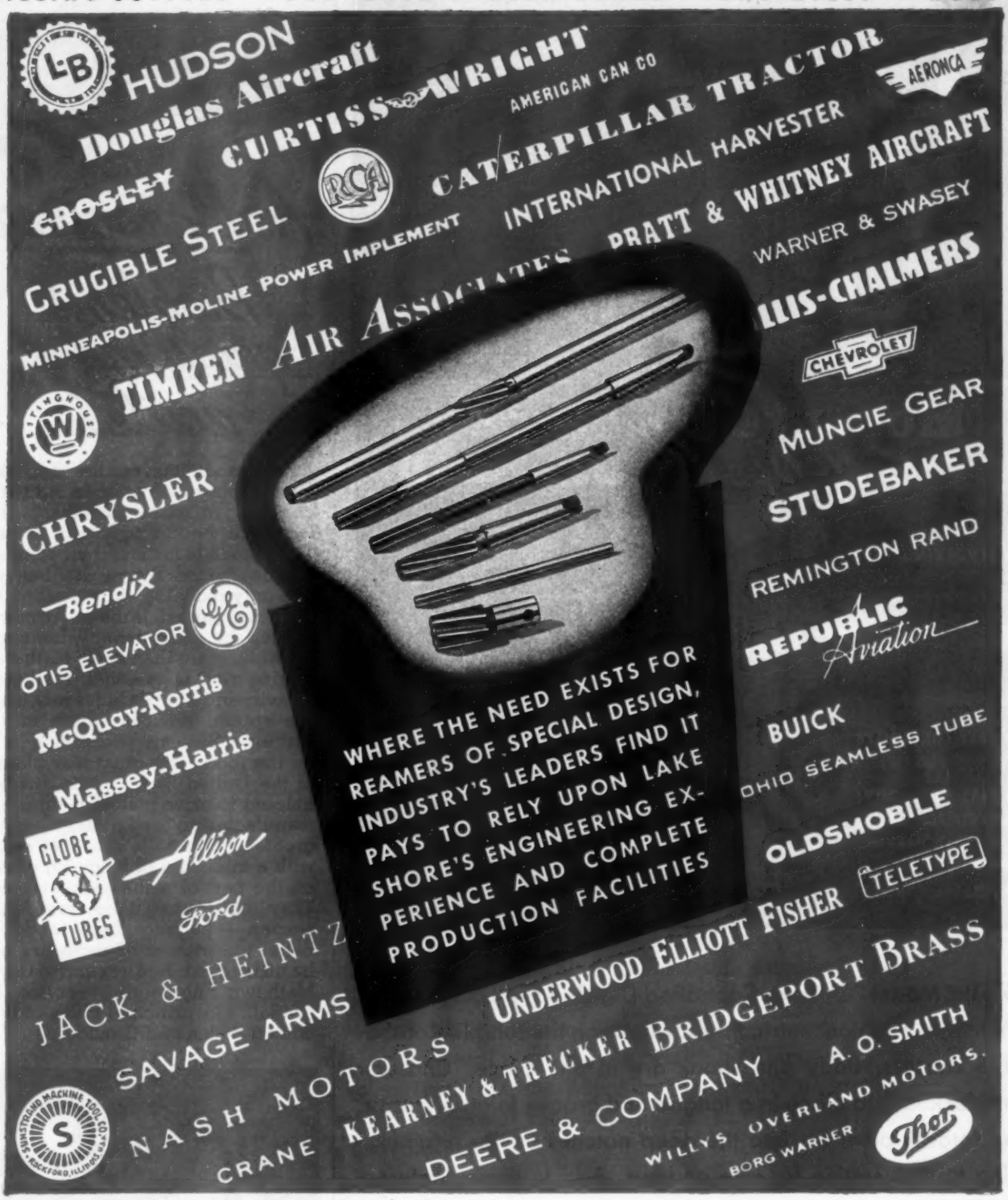

MILLING CUTTERS • BROACHES • FORM TOOLS • END MILLS • HOBS

Back of every Lake Shore Tool are the facilities and skilled personnel of one of America's most completely equipped plants.

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Send us your blue prints for quotations on your high speed tool, special tool, and carbide production tool requirements.

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FOR 35 YEARS

MODEL "C" *Automatic Self-Opening* DIE HEAD

- REVOLVING TYPE
- YOKE CONTROLLED TRIPPING AND CLOSING
- EASY TO REMOVE AND REPLACE CHASERS — *just flip the thumb latch and chasers are free.*
- SIZES from 9/16" to 2"

THE Model "C" Yoke Controlled Die Head will cut straight true and concentric threads through the long life of the R-S chasers. Body and shank are in one piece. Chasers are locked into place in a tongue and groove joint. A sturdy adjustable pawl fits into the deep notches of the retaining ring to lock setting for size and cut. Add to these features that assure sustained accuracy, the ease and simplicity of chaser removal, which is accomplished in less time than we take to mention it and you have a real production tool.

Write today for complete details and answers to your threading problems.

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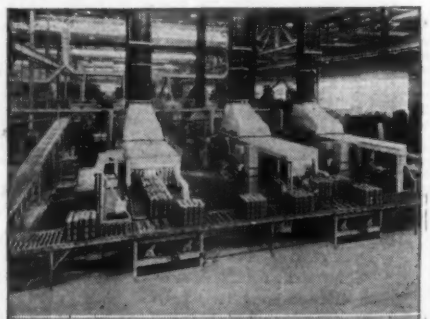
TAPPING MACHINES · SPECIAL THREADING MACHINES

As Manpower Problems grow more acute!

As war production reaches its peak, the manpower situation in industry changes. In most cases the problems are becoming more acute. The demands for men and women for the Armed Forces are heavy. The only recourse, if production is to be maintained, is the use of more women or older men, whenever possible. More than ever, Mathews Engineering is essential. Mathews Gravity and Power Conveyers, and the special devices which make Mathews Systems prominent, are on the job in the great war plants of the United States and Canada, helping to move materials through manufacturing departments, with greater control, lower cost, and with a minimum of fatiguing effort on the part of machine operators. They are serving these men and women — helping them to do a better job without unnecessary re-handling of heavy materials. Mathews Engineering service is available in principal cities of the United States and Canada.



Mathews Conveyer Company

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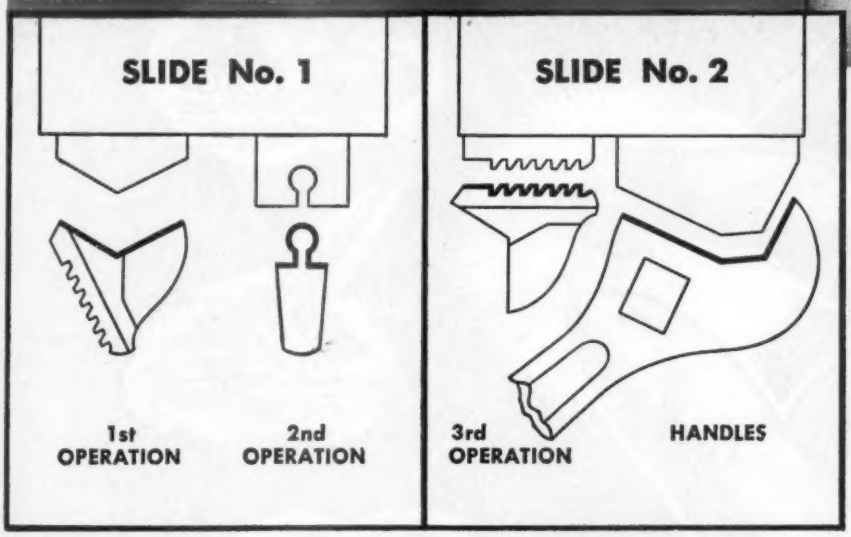
BROACHING WRENCHES

3 Times Faster

THAN BY FORMER METHOD



- ★ FEWER MACHINES
- ★ FEWER MEN
- ★ IMPROVED PRODUCT
- ★ MUCH LOWER COST

FIXTURE NO. 1 **FIXTURE NO. 2**

The schematic drawing above shows a set-up designed and built by Detroit Broach Company for broaching several surfaces on adjustable open-end wrenches. These operations are performed on a double slide surface broaching machine using hydraulically operated fixtures. Only one man is required to maintain a production rate three times as great as that formerly maintained using several men and several machines. In addition to increasing the speed of production, two surfaces are machined by the broaching method which were not touched by the former method. This set-up is arranged for broaching several sizes of wrenches.

There are operations in nearly every shop where the speed, accuracy and good finish provided by broaching can increase output and improve efficiency. Call in a Detroit Broach engineer. He will give you complete production and cost data on changing to broaching without obligation on your part.

ARMY E NAVY

DETROIT BROACH COMPANY

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Diamonds WERE NEVER MORE PRECIOUS

Reports from Germany and Japan tell us that in those countries gem diamonds are being removed from valuable jewelry and converted to industrial uses—such is the scarcity of industrial diamonds.

This is readily believable for diamonds have never been more precious than today when they serve so many purposes in vital war production. In 1943, American industry used about nine and a half million carats of industrial diamonds and will use still more in 1944. Without these diamonds, war production never could have reached its present levels.

The particular contribution of Wheel Trueing Tool Company is in building industrial diamonds into fine quality diamond tools, engineered to do a superlatively good job in truing and dressing grinding wheels for straight, form or thread grinding, diamond boring or turning tools, contact gage points and diamond bits for drilling and mining operations.

These tools have established an unexcelled record of performance in stepping up production, saving time and cutting costs, a record due in no small degree to the fact that they are backed by a third of a century of research and manufacturing experience.

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Brightboy is back of the Bren Gun and hundreds of other implements of war, contributing an entirely new conception of precision-quality finishing. On the basis of its war production record, Brightboy will continue to bridge the gap between the grind and the buff in peacetime production applications.

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Polishing and removing burrs on Bren Gun gas piston.

Close-up of finishing, gun extension posts.

BRIGHTBOY INDUSTRIAL DIVISION
WELDON ROBERTS RUBBER CO. Newark, 7, N. J.

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Engineered to Perfection. A New Standard of Accuracy.

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ALMOND THREE-JAW DRILL CHUCKS were the first to be placed on the market over Seventy years ago. As Pioneers in the field of Drill Chucks, the name "ALMOND" has long been associated with the logical procedure of machine developments. ALMOND DRILL CHUCKS are made in types and sizes to fit all machine tools and portable drills.

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The Original Manufacturers of Drill Chucks

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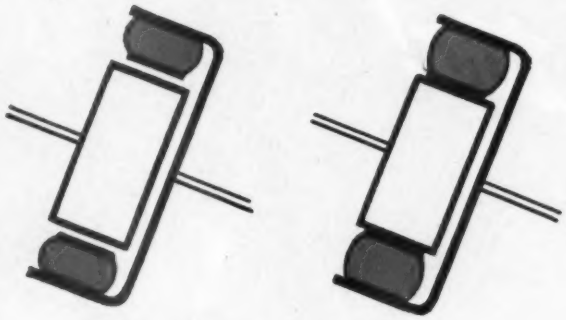
Ashburnham, Mass., U.S.A.

A Heavy Duty Clutch with a War Record

Simple · Positive · Trouble-free



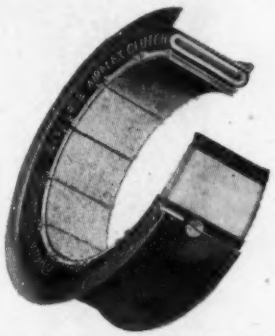
See how it works

This is a new type of heavy duty clutch. It controls power by air pressure. It is a new—but thoroughly proved—way to transmit power from its source to the machine that does the work.

At the left you see a diagram showing the clutch disengaged. A rubber and fabric air gland, on the drive member, rolls free of the driven member.

At the right, you see the gland inflated. It constricts against the driven member, to effect a clutch action that can be as light, or as firm, as you want it. Deflate the gland and the clutch is disengaged. That's the principle of the Fawick Airflex Clutch—as simple as that! It requires no levers, arms, toggles or springs—no lubrication. No adjustment—low maintenance—long service.

Ask for description booklet.



Here is the CLUTCH that brings you *these 12 Advantages*

1. Simple in design and operation
2. Flexible control by air
3. No adjustments or oiling—low maintenance
4. Dampens vibration—absorbs shocks
5. Corrects misalignment automatically
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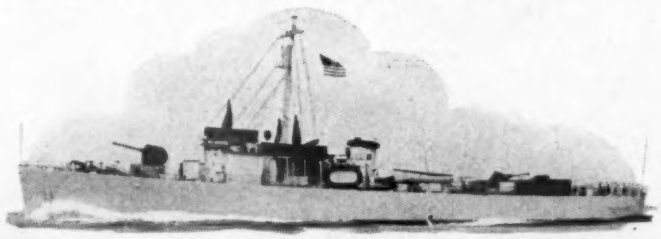
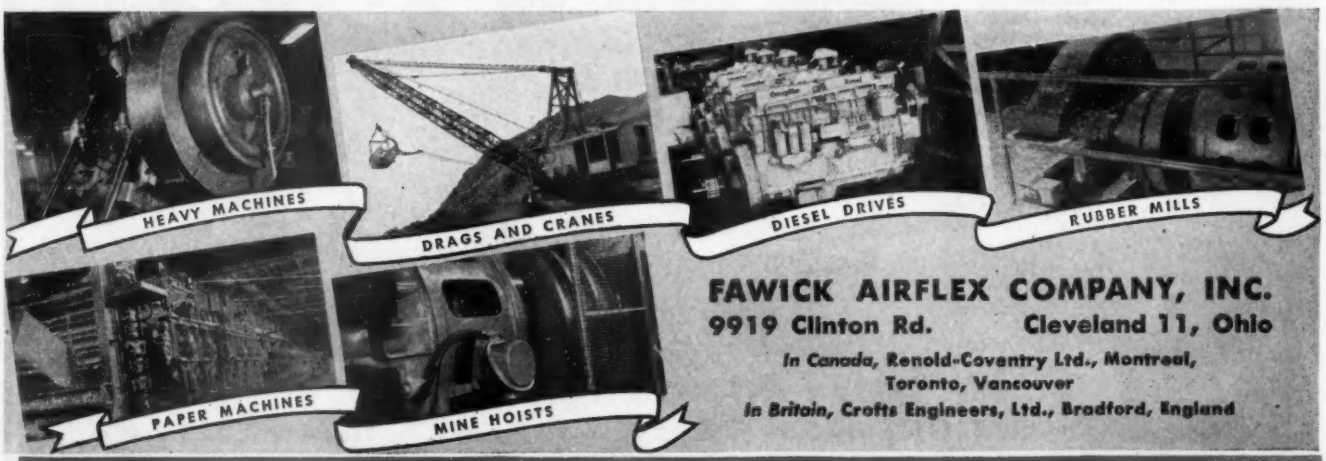
7. Runs cooler—uniform pressure
8. Controls torque by air pressure
9. Greater capacity—more compact
10. Remote control by air valve
11. Replaces flexible couplings
12. Acts as clutch, slip-clutch, break and coupling.

Here is PROOF OF PERFORMANCE



Many hundreds of vessels in the Navy and Merchant Marine are equipped with the Fawick Clutch.



FAWICK AIRFLEX COMPANY, INC.
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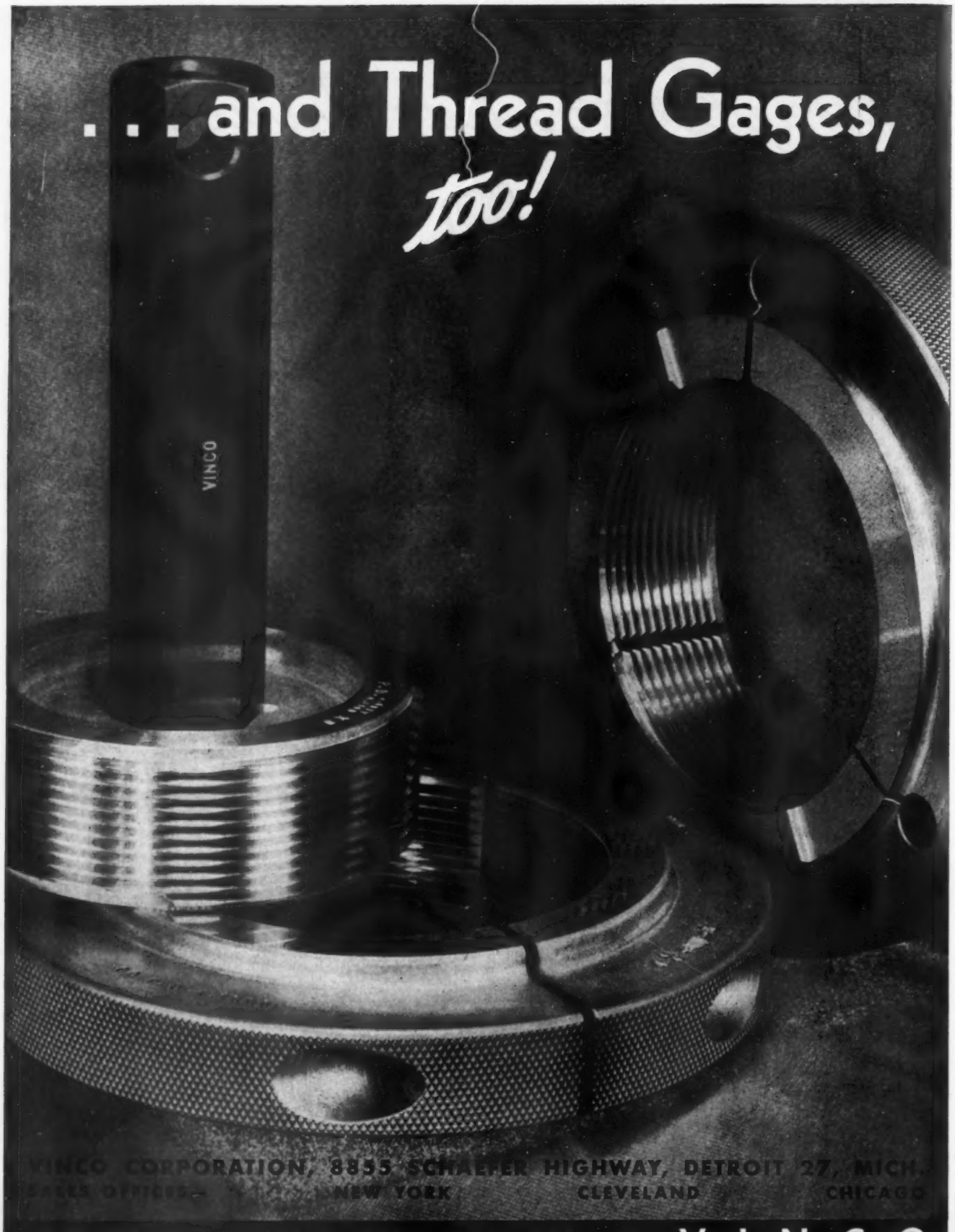
FAWICK *Airflex* CLUTCH

POWER CONTROLLED BY AIR



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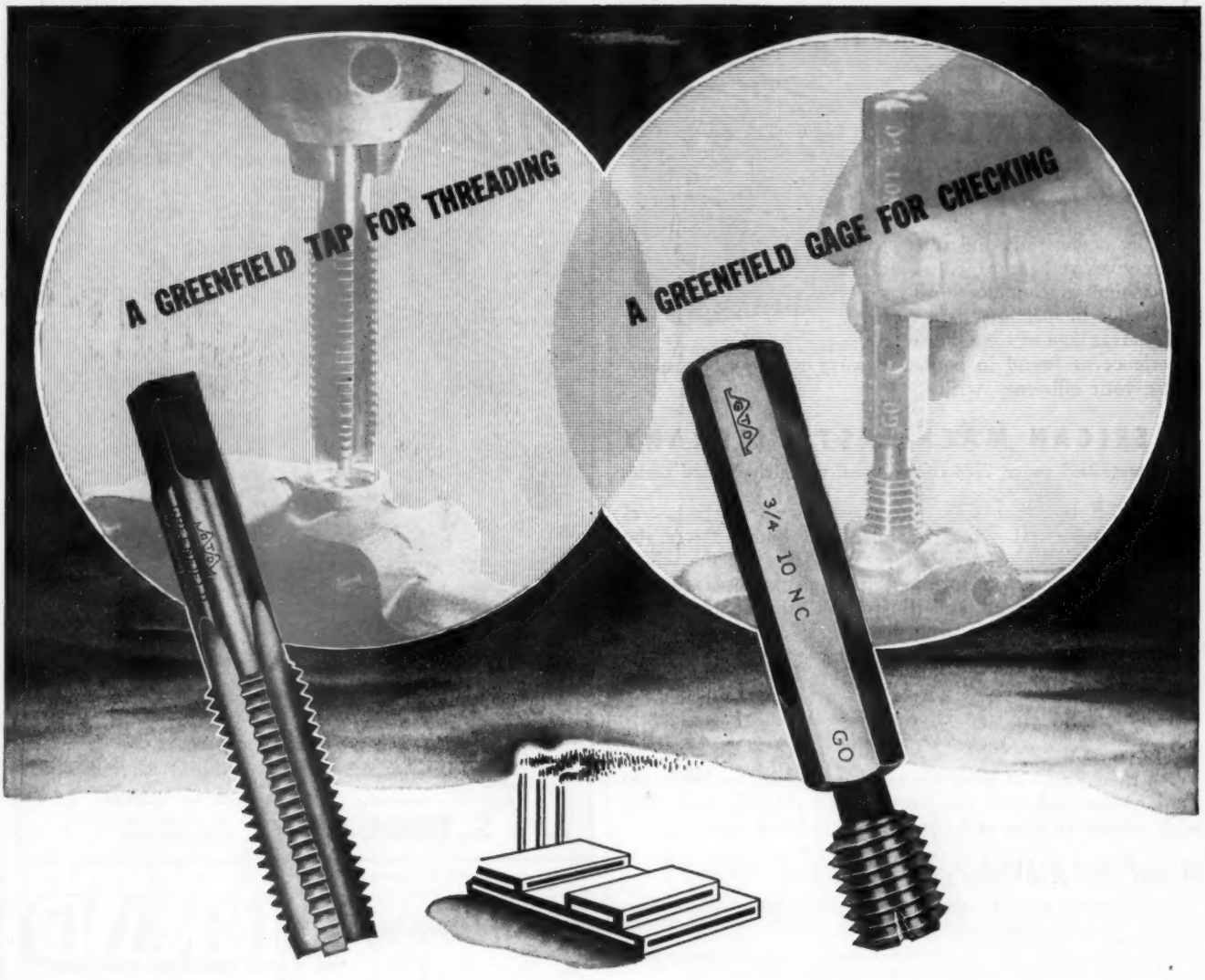

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Working together as closely as the navigator and pilot of a bomber, "Greenfield" Taps *and* Gages are a production team, cutting and checking billions of screw threads that hold together the interchangeable metal parts of modern armament. It is a team that must work with the greatest precision — and speed.

"Greenfield" is a leading manufacturer of both production taps and precision gages. As a team, these tools have met the challenge of an unprecedented wartime demand. A team mobilized and perfected for war production, "Greenfield" Taps *and* Gages will continue to help American industry win its peace-time battle of production as well.

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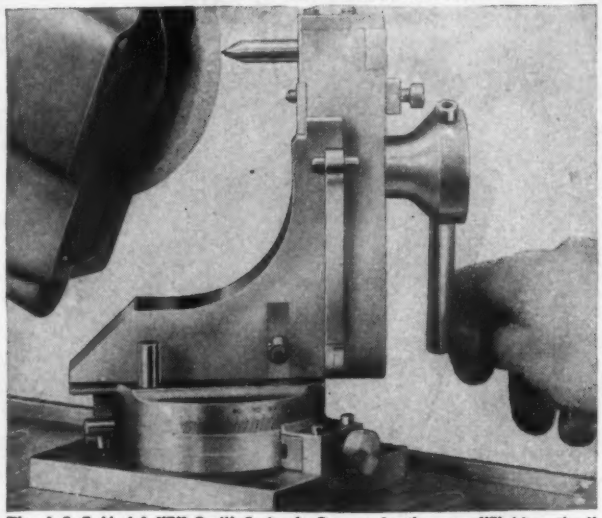

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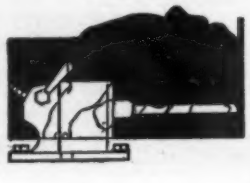

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Torit Dust Collectors will fit into your present and future production layouts. They protect employee's health and prevent wear on valuable machinery due to abrasive dusts. For complete information write:

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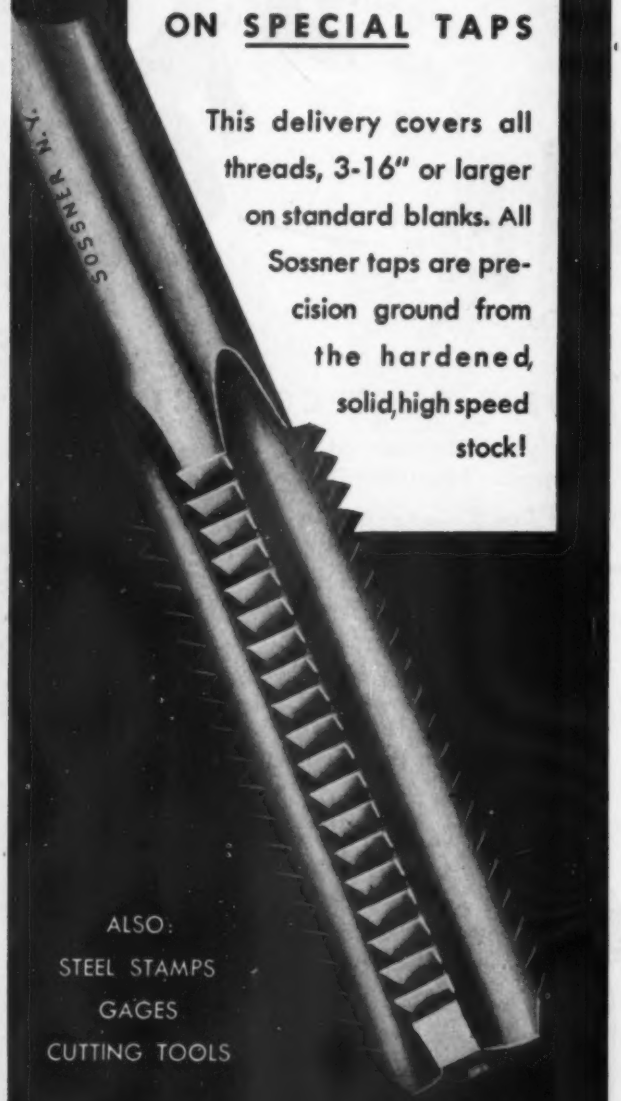

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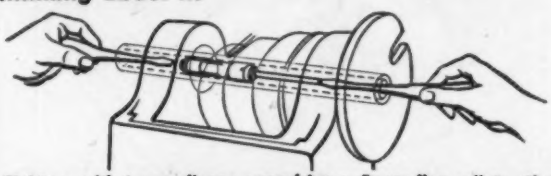
Here's a quick set-up for positioning repeat operations in your lathe. Tighten the Rieger Spindle Stop in the hole of the headstock spindle with two screwdrivers. You automatically limit entrance of work pieces . . . save measuring each piece in a run . . . assure accuracy. In short, the Rieger Spindle Stop enables you to put your lathe on a *production basis* for repeat operations. Regular model fits ¾" holes. *Won't scar or burr walls.* Ready for immediate delivery. Ask for complete information. Write *now* while you're thinking about it.



Tightens with two ordinary screwdrivers. Expanding collet action. Won't mar spindle. Model SS-75 fits ¾" holes — Atlas, Clausing, Craftsman, Logan, 9" South Bend lathes, and others.

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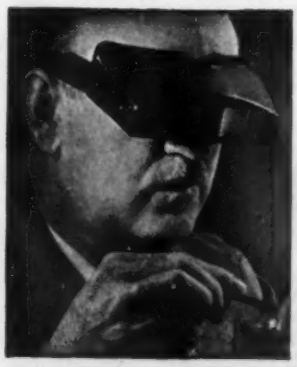

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A grinding wheel in perfect balance helps turn out jobs faster . . there is no vibration to slow up schedules or leave marks on the work. As a result, Sterling makes certain the wheel you receive from us is in balance for positive grinding results. Those extra minutes we spend checking the balance of your "Wheels of Industry" mean extra hours of trouble-free grinding . . important for war and peacetime production!

Balancing should continue in your plant. A wheel should be balanced after truing, since the operation often throws a wheel out of balance. As a wheel wears down, it should be balanced. Wheels used with grinding fluid should be run long enough to throw off any absorbed moisture before being put to work.

There are many ways to increase grinding efficiency . . balancing is but one of them! Sterling engineers will gladly make suggestions for doing your unusual jobs better. Often, they recommend slight changes in set-up that involve no replacement of your present wheel. Sterling quality and engineering efficiency often increase production 25%—and more! Write us . . we will gladly help solve your problem.

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THROUGHOUT THE NATION

Abrasive RED BAND
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DRESSING TOOL COMPANY
Detroit, Michigan

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Take advantage of Prescription-Fitting and Custom-Compounding when you buy mounted points, mounted wheels and internal grinding wheels.

It's virtually impossible to go wrong with Radiac service. First of all, the wheel is selected for your individual job by a "prescription-fitting". Then it is specially "custom-compounded." But that is not all. The "prescription" is filed by us so that repeat orders can be quickly and accurately filled. Radiac gives you the right wheel the first time and every time! Write for booklet with complete details on Internal Grinding Wheels (booklet #1) and Mounted Points (booklet #2).

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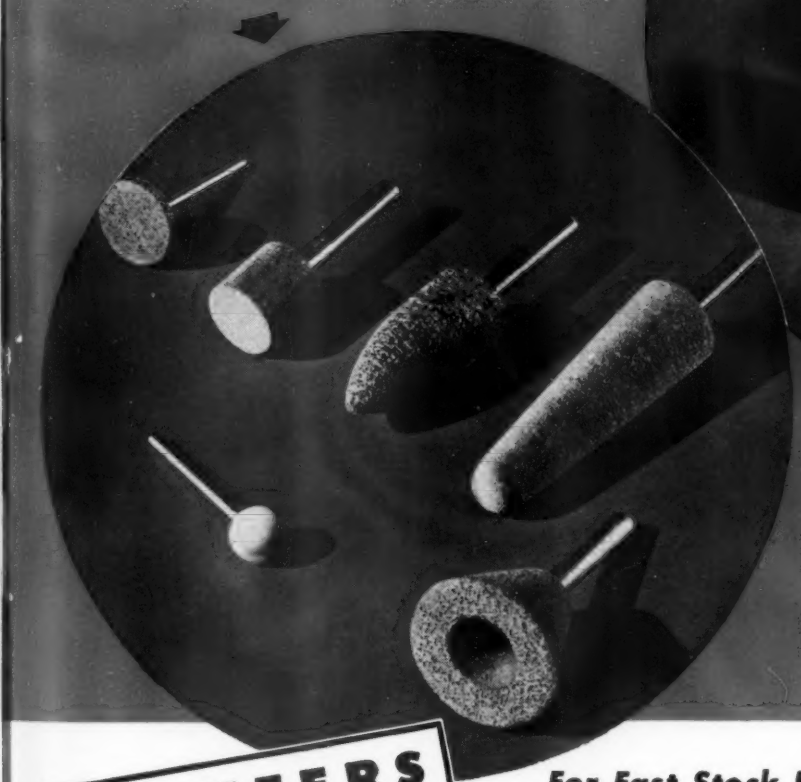
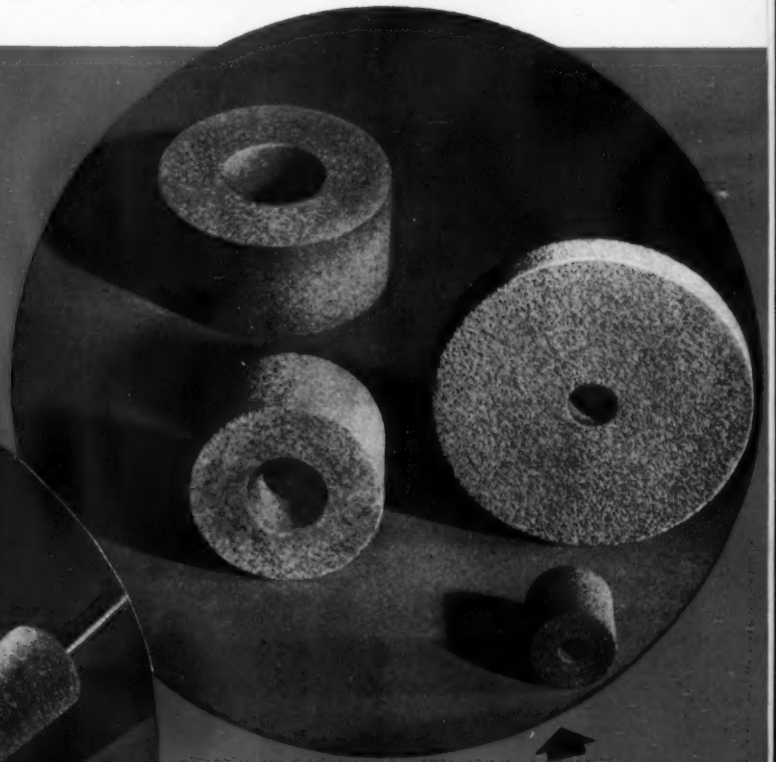
All wheels and points are dressed and finished ready to use (no finishing, by you necessary) • All kiln glaze is removed • All are 100% tested to precision tolerances • Concentricity is guaranteed • Special Bakelite cement secures wheel to mandrels • Radiac Mounted Points and Mounted Wheels are available in tough, regular aluminum oxide (brown) or in special aluminum oxide (white or red bond) for greater friability.





RADIAC INTERNAL GRINDING WHEELS

All wheels are 100% tested to precision tolerances • Every wheel is a product of pioneers in the development of internal grinding wheels • Radiac Internal Grinding Wheels are available in tough, regular aluminum oxide (brown); in special aluminum oxide (white or red bond) or a special exclusive "Blue Glass" friable bond which permits an increase in the ratio of cutting grain to bond

PIONEERS
in the development of mounted points, mounted wheels, and internal grinding wheels.

For Fast Stock Removal, Long Life, Cool Cutting—

RADIAC*

Radiac POR-OS-WAY— Radiac PARAFLEX —Radiac Mounted Points and Mounted Wheels — Radiac Internal Grinding Wheels — Radiac Abrasive Cut-Off Machines and Discs.

*T.M. Reg. U.S. Pat. Off.

A. P. DE SANNO & SON, INC., 430 Wheatland Street, Phoenixville, Penna., Since 1893

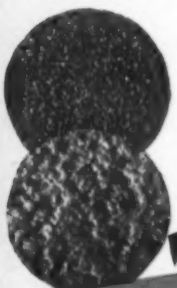
NEW YORK • PITTSBURGH • CLEVELAND • DETROIT • CHICAGO • LOS ANGELES

"We don't have to 'baby' this wheel—"

"One of our jobs is grinding hardened high speed steel punch blanks. We used to take off .006" at a pass and congratulate ourselves. Now Por-os-way removes .020" at a clip... without loading or burning. Holds its corner and requires no dressing. It's one wheel we don't have to 'baby'." Try Por-os-way yourself and for production's sake don't baby it. Don't be satisfied until you've pushed the Por-os-way wheel to the utter limit of its possibilities. Send today for the booklet "Facts about Por-os-way"—with the prescription blank. Then order a trial wheel and TRY it!

CHIP CLEARANCE—AN EXTRA ADVANTAGE

Taps have it! Cutting tools have it! It's chip clearance! The very porous structure of the Por-os-way wheel provides chip clearance NATURALLY so material can be removed without interfering with the tiny grinding edges. Proved by long, curling chips. Reflected in the greatly reduced need for dressing.



THIS MAKES THE DIFFERENCE—

You can spot the difference between an ordinary wheel (top) and a Por-os-way wheel (bottom) with the naked eye. The extra porosity of Por-os-way is the reason for more than 8 distinct operating advantages.

*T. M. Reg. U. S. Pat. Off.
Copyright, 1944, A. P. de Sanno & Son, Inc.

2 TO 5 TIMES MORE PRODUCTION PER MAN PER MACHINE

Por-os-way engineers pioneered in adopting the open structure wheel for precision finishing. And yet the same wheel—at a deeper cut—can often be used for rough grinding as well as finishing, ending time wasted in wheel changes and additional finishing steps.

The List of Por-os-way Users Reads Like a Blue Book of American Industry, Included are:

Edward G. Budd Mfg. Co. • Buick Motor Division of General Motors • Curtiss-Wright • Douglas Aircraft • SKF Industries • Studebaker Corporation • Timken Roller Bearings • Wadell Engineering Co. • Westinghouse Electric • Wright Aeronautical

RADIAC*

POR-OS-WAY*

A. P. DE SANNO & SON, INC., 430 Wheatland St., Phoenixville, Pa., Since 1893

NEW YORK, PITTSBURGH, CLEVELAND, DETROIT, CHICAGO, LOS ANGELES

Radiac POR-OS-WAY • Radiac PARAFLEX • Radiac Mounted Points and Mounted Wheels
Radiac Internal Grinding Wheels • Radiac Abrasive Cut-Off Machines and Discs

MORSE THERE IS A DIFFERENCE TWIST DRILL AND MACHINE COMPANY
NEW BEDFORD, MASS., U. S. A.

NEW YORK STORE: 130 LAFAYETTE ST. - - - - CHICAGO STORE: 570 WEST RANDOLPH ST.
SAN FPANCISCO STORE: 1180 FOLSOM ST.

★ ★ ★ OUR SURVEY SERVICE . . . . guides you to the *Right* DIAMOND TOOL FOR THE JOB!

Through specific written recommendations this Golconda Survey Service assists you to maintain maximum operating efficiency from your tools.

It always gives you —

- ★ The correct diamond for the individual job
- ★ Closer tolerances from your operator
- ★ Reduction of rejections
- ★ Cut down inventory

This service is free—it involves no obligation on your part.

Write for our free booklet

No. 21

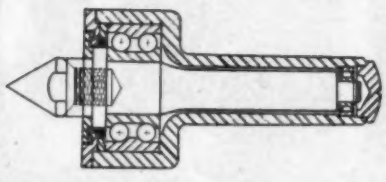
It fully describes the Golconda Survey Service and contains valuable and useful information on diamonds and their uses in the tools of modern industry.

The DRAG ANGLE FINDER
A Valuable Instrument Furnished Our Customers.

GOLCONDA DIAMOND Products Corp.
3420 NORTH KNOX AVENUE
CHICAGO 41, ILL.

Made to your blueprints with precision accuracy and fine workmanship, A.C.E. special cutting tools provide long cutting life. Send us your inquiries for prompt estimates. Bulletin on request.

AMERICAN CUTTER AND ENGINEERING CORP.
31745 MOUND ROAD, WARREN, MICH.



POINTS RUN TRUE

and stay true because center runs on double row angular contact preloaded precision bearing at front end and on stabilizing precision roller bearing at back end.

Write for complete catalog A 44.

The READY TOOL CO.
IRANISTAN & R. R. AVENUES.
BRIDGEPORT . . . . . CONN.

New Oakite Service Report *Free* for the Asking!

PSEUDOMONAS OLEOVORANS, shown in the photo micrograph above, is a typical member of the group of bacteria commonly found in coolants used for machining, grinding, cutting, milling, drilling and similar operations, when coolants become rancid. To control the growth of such bacterial organisms, particularly during the hot months . . . help minimize dermatitis infection . . . follow the practical suggestions given in this new 4-page Special Service Report.

Gives Specialized Methods

It describes specialized Oakite materials and methods for cleaning out the main supply tank, individual tanks on machines, supply lines and pumps as well as proven techniques for subsequent germicidal treatment of this equipment. Also discussed are eleven suggestions for promoting plant cleanliness and individual hygiene.

In taking advantage of the procedures recommended in this Report, you will find that you not only can more effectively control bacteria growth and help prevent oil-water coolants from becoming rancid and foul smelling, but also extend the working life of these coolants. They will help cut down the costly expense of discarding contaminated solutions and the loss of time and effort involved before tanks can again be recharged.

Drop Us A Postcard . . . NOW!

Of vital interest to every plant supervisor who uses soluble oils in machining, you, too, will want to read the valuable data contained in this interesting Report. Drop us a postcard . . . NOW! You will have the Report on your desk in a few days. There's no obligation, of course!

Manufactured only by

OAKITE PRODUCTS, INC., 24 Thames Street, NEW YORK 6, N.Y.

Technical Service Representatives in All Principal Cities of the United States and Canada

OAKITE MATERIALS METHODS SERVICE

CLEANING FOR EVERY CLEANING REQUIREMENT

THE SURFACE PLATES THAT ARE ACCEPTED AS *STANDARD* BY DESIGNERS OF FIXTURES AND GAGES

MACHINE PRODUCTS CORP.

6771 E. McNICHOLS ROAD
DETROIT 12, MICH.

Manufacturers of Precision Angles, Parallels, Straight Edges, etc.

BUY WAR BONDS

Because these plates provide ample space for bolting fixtures to assure accuracy in checking and because they will stay as constructed without deflection, designers of checking equipment prefer Machine Products Surface Plates for built-up fixtures and gages. Made of uniform Meehanite iron, rough machined, carefully heat-treated, finish machined and hand scraped to proved master plates.

Specially designed stands are available for any sized Machine Products Corp. plate. Send for descriptive catalog.

Wide Range of Sizes
7 x 7½
7 x 14
8 x 12
9 x 9
10 x 15
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12 x 24
12 x 36
14 x 14
14 x 18
14 x 46
14 x 52
16 x 16
16 x 24
16 x 48
18 x 18
18 x 24
18 x 36
20 x 30
24 x 24
24 x 36
24 x 40
24 x 48
24 x 60
30 x 36
30 x 48
30 x 60
30 x 84
30 x 88
36 x 36
36 x 48
36 x 60
36 x 68
36 x 72
42 x 42
48 x 48
48 x 60
48 x 72
48 x 96
48 x 144
48 x 168
54 x 80
60 x 120
72 x 72
72 x 96
72 x 168
84 x 168
96 x 168
96 x 192
100 x 100

BOTTOM VIEW
Note special ribbing.

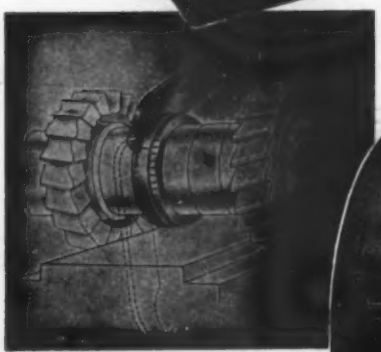
TOP VIEW

FAST, ACCURATE SPACING

for
SIDE MILLING CUTTERS
GANG MILLING SET-UPS

DAYTON ROGERS ADJUSTABLE SPACING COLLARS

are made in 12 standard sizes for cutter arbors from ⅜" through 2"—other sizes on request.



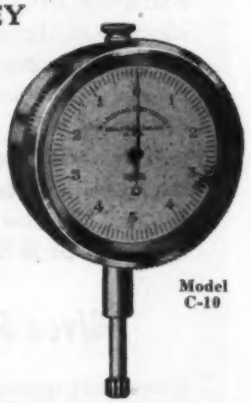
You have plus or minus .0005" at your finger tips with Dayton Rogers Adjustable Spacing Collars. Graduated in thousands, you can make an accurate and positive adjustment by simply loosening the cutter arbor nut and making necessary corrections as illustrated above.

Try them once and you will never run a gang or multiple milling job without them. Write today for full particulars.

DAYTON ROGERS MFG. CO. Minneapolis, Minn.

RANDALL & STICKNEY
New 1/10,000" Indicator
Model C-10

Range	.3"
Diameter of case	1 15/16"
Diameter over all	3⅛"
Depth of case	⅞"
Length over all	3½"
Lug or Bracket—Offset, on center if desired	Hole 3/16"
Back held in position by	4 large screws
Center of spindle to center of hole in lug	15/16"
Weight	8 ounces
Stem	9/32 diam.
Dial	0-5-0 or 0-10
Graduated	.0001"
Crystal	Non-breakable



Model C-10

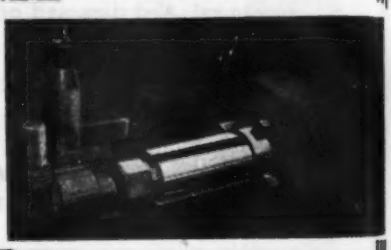
RANDALL & STICKNEY
Waltham 54, Mass, U.S.A.

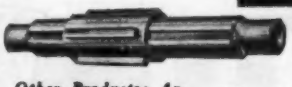
Makers of Gauges Since 1885

SAVE TIME with NICHOLSON

E-X-P-A-N-D-I-N-G MANDRELS

You also PROMOTE PRECISION when you equip your shop with these economy tools for holding work while being machined. Hardened tool steel; precision ground.





Type B (illustrated) is Straight Jaw Design. Also available in Step Jaw Design (Type A). All sizes: singly or in sets. Prompt delivery. Bulletin 1043.

Other Products: Arbor Presses, Control Valves, Steam Traps, etc.

W. H. NICHOLSON & CO.
114 OREGON ST., WILKES-BARRE, PA.

LATROBE

RED ARROW 101 *for* METAL CUTTING TOOLS

BORING *and* FACING

MILLING

*What users say!**

SUPERIORITY
"Grooving brass shells at 860 S.F.M. We get 10,000 to 11,000 pieces per grind compared with 6,600 pieces per grind with former tools."

LONGER TOOL LIFE
"Your Red Arrow 101 has been running 40 hours between grinds at 400 S.F.M. on grey iron. Our operators like it better because cutting edges do not break down and that means more production faster."

TOUGHNESS
"We are machining steel rings which are welded and steel castings with intermittent cuts. We plan to use Red Arrow 101 on all our tough jobs."

LESS TOOL GRINDING
"We find Red Arrow 101 very satisfactory. It runs double the production of other tools we have used on our boring jobs."

HIGHER SPEEDS
"Red Arrow 101 tool bits enable us to increase the surface speed 100% with four times the tool life."

**Selected at random from field reports.*

Write for this Bulletin ←

Latrobe RED ARROW 101—the Cobalt-Chromium-Tungsten alloy that can be cast into many types of metal cutting tools—is furnished in the "as cast" state ready for grinding to finished tool dimensions. Improved casting technique enables us to produce castings of such uniform structure that "notching" of the gate end of Tool Bits is unnecessary. Standard Tool Bits are carried in warehouse stocks.

Latrobe RED ARROW 101 requires no heat treatment; is easily brazed to tool shank or body; will operate at greatly increased speeds and effect valuable savings in production time.

Ask our service department to help you with any problem concerning the use of Latrobe RED ARROW 101—either applications, speeds, grinding, brazing or any other detail.

Latrobe ELECTRIC STEEL COMPANY

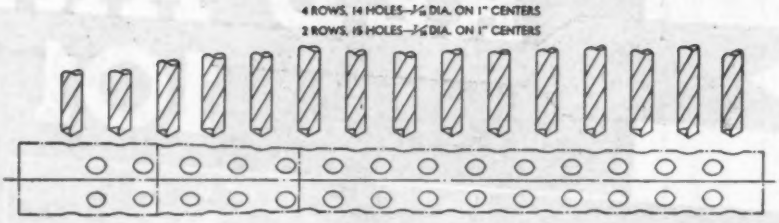
MAIN OFFICES *and* PLANT · · LATROBE · PENNSYLVANIA

15 SPINDLE HOEFER UNIT

Drills Seamless Steel Tubing
BARREL JACKET

A fifteen-spindle head, guide bushing plate and side indexing fixture with six station indexing work holder, drilling eighty-eight 7/16-inch holes, 1-inch centers in air cooled jacket of machine gun.

As production increases so do savings with Hoefer Multiple Spindle Heads. These units will more than repay your investment in the quality of work produced and in uninterrupted service that contributes so greatly to lower cost operation. Our many years of experience in manufacturing Multiple Spindle Heads qualifies us to take over your problem and solve it for you. No matter what your job is we can furnish the head to meet your production need. Add a Hoefer Head to your present machine and turn it into High-Production Money-Saving Equipment.



Job requires 4 rows, 14 holes—7/16" diameter on 1" Centers and 2 rows, 15 holes, 7/16" diameter on 1" Centers. Drill turns 70' per minute with .007" per revolution feed or 4.277" penetration per minute. Travel, drilling depth including tip of drill, ¼". Drilling time per row 3½ seconds.

Hoefer's Whole Business is Holes . . . . **HOEFER MFG. CO.** *Freeport, Ill.*

MASTER GAUGES are in there Pitchin'

MASTER GAUGES

THREAD PLUGS
THREAD RINGS
PLAIN PLUGS
PLAIN RINGS
SNAP
PROFILE
BUILD-UP
CONCENTRICITY
JIGS and
FIXTURES

MASTER GAUGE CO.

2214 FENKELL AVE. DETROIT 21, MICH.
Phone: University 3-7676

HARDNESS TESTER

Let the SCLEROSCOPE speed up the production of that s so we can blow the Axis to **HELL**

Write for Circular!

THE SHORE INSTRUMENT & MANUFACTURING CO., INC.
9025 VAN WYCK AVENUE
JAMAICA, NEW YORK
TELEPHONE: JAMAICA 6-4090

ANNOUNCING A NEW LINE! *Precision* **DRILL JIG BUSHINGS**

Behind this line are the special skills and experience derived from the successful manufacture of "Precision" Collets and lathe attachments. . . . On a production basis for the first time, "Precision" Drill Jig Bushings have been made widely on special order for two years.

Write us for catalog.

General Die-Stamping-Tool Co., 262-272 Mott St., N. Y. 12, N. Y.

C-F POSITIONERS

LESS HANDLING - MORE WELDING

C-F Positioners enable you to do down-hand welding on any part of the weldment, top, bottom, sides—to produce more uniformly perfect welds—stronger joints, smoother, neater fillets and beads which require less grinding. Eliminates handling delays, converts *"handling time"* into *"welding time"*—saves crane service, saves floor space. Table revolves a full 360°, tilts up to 135° beyond horizontal, and is adjustable for height. Models taking up to 30,000 lbs., handle wide range of work, handle larger unbalanced loads. Hand or push button operation. These are universal tools—pedestal or boom mounted to give maximum floor and working clearance.

Write for Bulletin WP-22

CULLEN-FRIESTEDT CO., 1313 S. Kilbourn Ave., Chicago 23, U.S.A.

PREVENT CONTAMINATION—EXTEND TOOL LIFE

with the NEW BARRETT COMBINATION STERILIZER AND SEDIMENTOR for CUTTING OILS . . . .

Barrett Sterilizer and Sediment Precipitator arranged for fully automatic operation.

Protects your operators against infection—insures more and better work from your cutting tools—by sterilizing your cutting oils and precipitating sediment *at the same time.*

The NEW BARRETT STERILIZER AND PRECIPITATOR combines these two operations in one piece of apparatus which can be depended on to handle both operations effectively, efficiently and economically. Sterilization is by heat and is a positive active operation in the line ahead of the supply tank. By locating in this position, contamination is intercepted before the cutting oil is conditioned for safe, bacteria-free reuse.

Because of the heat to which the oil is subjected during sterilization, the viscosity of the cutting oil is reduced, thereby encouraging precipitation of minute heavy particles. The sediment thus liberated settles out and drops by gravity to the bottom of the sterilizer where provision is made to scrape the precipitated solids from the conical bottom and clean them out.

By thoroughly and constantly sterilizing and effectively removing solid matter, the Barrett Combination Sterilizer and Sedimentor reconditions cutting oil for reuse; sterilized for safety's sake and abrasive-free for longer tool life.

GET COMPLETE INFORMATION NOW

These units are available for floor, wall and post mounting and are furnished with semi-automatic or full automatic control as required. Send at once for detailed information on this timely Barrett development.

THE LEON J. BARRETT COMPANY, 1800 Grafton Road, **WORCESTER, MASS.**

Designers and Builders of Centrifugal Machinery

HERE'S WHAT WE MEAN BY

SUPER Performance!

When we say that with Super Carbide-Tipped Milling Cutters you can get faster cutting, cleaner cutting, finer finishes, greater accuracy and longer cutter life, we speak from the records . . actual performance records of Super Milling Cutters in our files in Detroit. Here are some examples:

1. On one straddle milling job in 4140 SAE steel, 40-43 Rockwell Hardness, the HSS cutters were operated at a surface speed of 50 FPM. With Super Carbide Tipped cutters the surface speed was stepped up to 300 FPM. On this same job, the table feed was increased from ⅞" per minute to 7½" per minute. Other economies resulted through an increase from 90 pieces per grind to 216 pieces per grind. And in addition, with the Super Milling Cutters the job was run dry and the floor to floor time per peice was reduced from 30 minuted to 10 minutes.

2. On an end milling job on a steel forging a HSS cutter was operating at 80 RPM with a table feed of 3⅝" per minute. When a Super Carbide-Tipped Shell End Mill was used, the RPMs were stepped up to 415 and the table feed increased to 12⅛". In addition the Super Cutter produced 90 pieces per grind as compared with 60 with the HSS cutter.

Why not try Super Carbide-Tipped Milling Cutters TODAY . . . and see for yourself what we mean by SUPER PERFORMANCE?

HAVE YOU RECEIVED THIS BOOK?

If not, write for your free copy TODAY. It illustrates and describes the complete line of Super Carbide-Tipped Tools.

SUPER TOOL COMPANY

Carbide Tipped Tools

21650 Hoover Rd., Detroit 13, Mich. 4105 San Fernando Rd., Glendale 4, Cal.

SPECIFY Precision LATHE ATTACHMENTS

IMMEDIATE DELIVERY FROM STOCK

For 10" Atlas & Logan, 9" South Bend ½" Capacity Lathes, etc.

Order from your dealer or write us for literature.

SpeediChuk WITH THE Precision BREN COLLET

- Increases ½" collet capacity lathes to ¾".
- Ready for instant use and interchangeable on any 1½" x 8 thread spindle lathe . . . Atlas, Logan, 9" South Bend, Clausing, etc.
- Full Spindle Accuracy.
- LEVER TYPE for continuous production. Feather pressure releases work while lathe is running. LIST $79.50, Collet extra.
- HAND TYPE for use where quantity production is not required. Lathe must be stopped to open and close collet. LIST $19.75, Collet extra.

GENERAL DIE-STAMPING-TOOL COMPANY

PRECISION COLLET DIVISION 262-272 Mott St., N.Y. 12, N.Y.

LUERS Patented Cutting Off Tool Holders Patented Cutting Off Blades

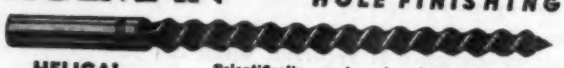
ONLY the PATENTED construction of LUERS cutting off BLADES permits normal expansion of bursting chips — MEANS MAXIMUM CUTTING EFFICIENCY.

Manufactured By

J. Milton Luers — 12 Pine St. — Mt. Clemens, Mich.

Produced under License Issued by John Milton Luers Patents Inc.

HOLMAN BETTER, FASTER HOLE FINISHING

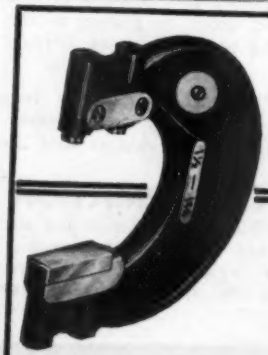


HELICAL TAPER PIN REAMERS

Scientifically made of selected steel under modern processes. Long lived, economical, accurate. Details on request.

HOLMAN REAMER CO.

MANCHESTER, CONN.



PHOENIX ADJUSTABLE LIMIT SNAP GAGE

A Gage with Locking Cams which will stay set

Good Delivery

Send for Folder

PHOENIX GAGE CO., Phoenix, N.Y.

Faster Finishing

SEVERANCE MIDGET MILLING CUTTERS TAKE DEEP SHARP BITES

On metal, wood or plastic parts, castings or patterns Severance cutters take deep sharp bites instead of merely burnishing. They throw off clean chips instead of dust.

For every type of finishing and deburring, Severance cutters do a quicker, faster job than ordinary rotary tools, rasps or burrs. Equally efficient with portable power tool, with stationery set-up or by hand.

Severance cutters can be successfully reground scores of times without losing their effective cutting qualities. If you are having difficulty in finishing any manufactured parts, send us samples and our engineers will design cutters to solve your problems.

Severance "Carbide" Midget Milling Cutters are available in a wide variety of shapes and sizes.

Severance

SEVERANCE MIDGET MILLING CUTTERS • PRECISION RE-GRINDING. Severance Tool Industries Inc., Saginaw, Mich. • Plants in Long Island City 1, N. Y.; Detroit 2, Mich.; Fort Wayne 8, Ind.; Chicago 6; and Los Angeles 21. In Canada: 60 Front Street West, Toronto, Ontario.

Another New Member of the

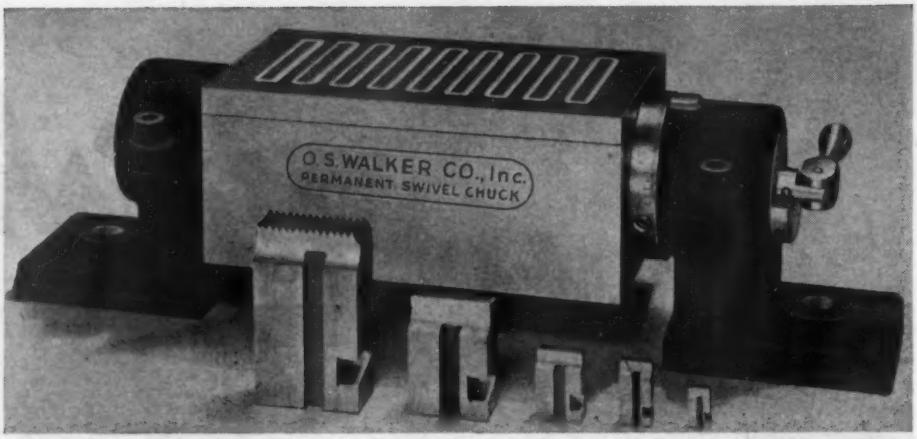
WALKER LINE

•

Swiveling Type

PERMANENT MAGNETIC CHUCK

•



These new Permanent Magnetic chucks—with 35% more holding power, greater effective magnetic area, are the result of Walker's many years specialization. Their greater holding power is retained indefinitely.

In the new Swivel Chucks, a graduated dial is provided for accurate setting at any point over a swiveling arc of 180°. With only 3/8" between pole divisions, the top plate is totally magnetic, thereby contributing to greatly increased holding power assured.

This new development—in response to the demand for a permanent magnetic chuck having all the features of an electro magnetic chuck—supplements the regular Walker line of Walker Magnetic Chucks.

Walker Permanent Magnetic Swivel Chucks are available for early shipment in three sizes: 4" x 8"; 6" x 18"; 8" x 24".

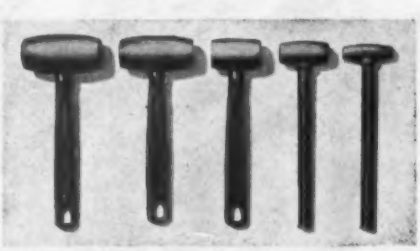
Write today for Descriptive Circular.

O. S. WALKER CO. Inc., WORCESTER, MASS., U. S. A.

FOR SAFETY'S SAKE . . . USE **JOHNSON'S LEAD HAMMERS with SHUR-GRIP Handles!**

COSTLY slips can mean vital man-hours lost. Prevent accidents by equipping your shop with Johnson Hammers. Specially designed SHUR-GRIP Handles afford user a "bull-dog" grip and are practically indestructible. SHUR-GRIP handles are used only with our 3, 4, 5 and 6 lb. lead hammers.

Shown here are hammers with SHUR-GRIP and plain handles, ranging in weight from 1 to 11 lbs. These sizes in stock.



Write Dept. A for illustrated bulletin and price list

JOHNSON TOOL COMPANY

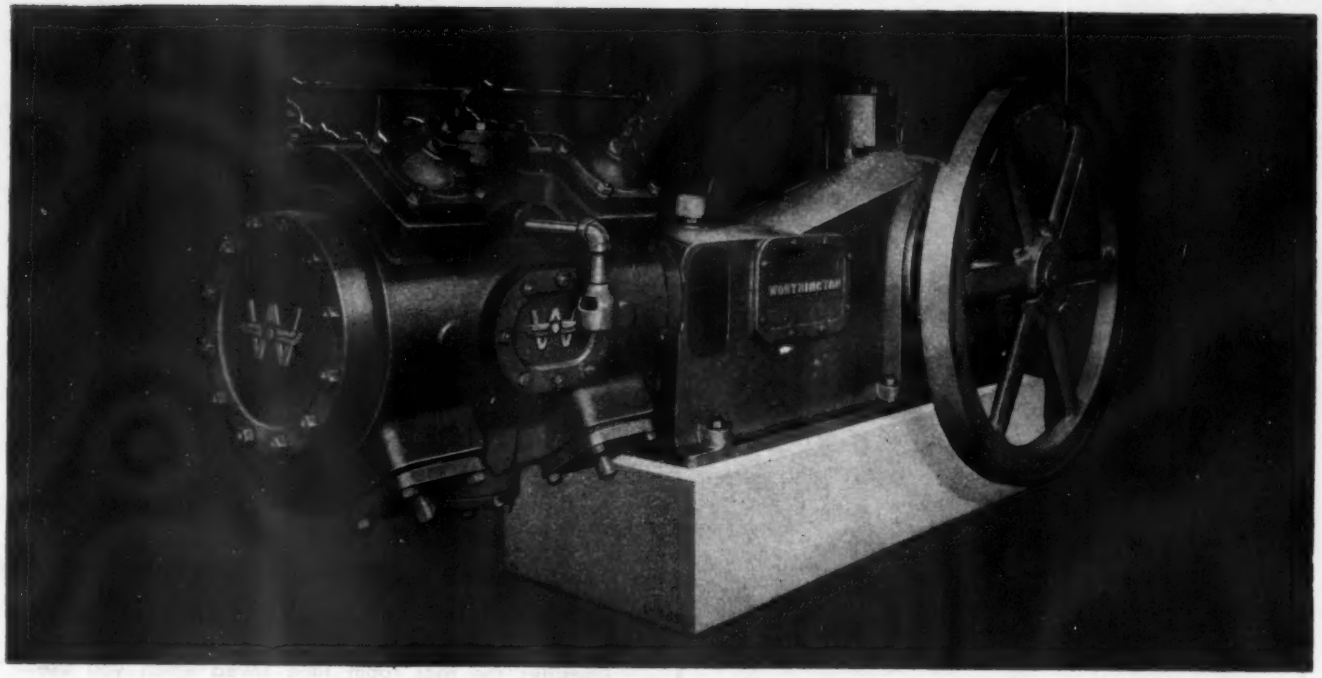
PLASTIC MOLDS • TOOLS

65 MASSASOIT AVE. • EAST PROVIDENCE 14, R. I.

Universal Floating Chucks drill, counter-bore, ream or pilot from a lead hole. Adjustable pressure compensates for tool weight, allows increased feed without causing marred holes. For horizontal operation in screw machines and turret lathes. Write today for further facts about Universal Floating Chucks, Collet Chucks and Drill Bushings.

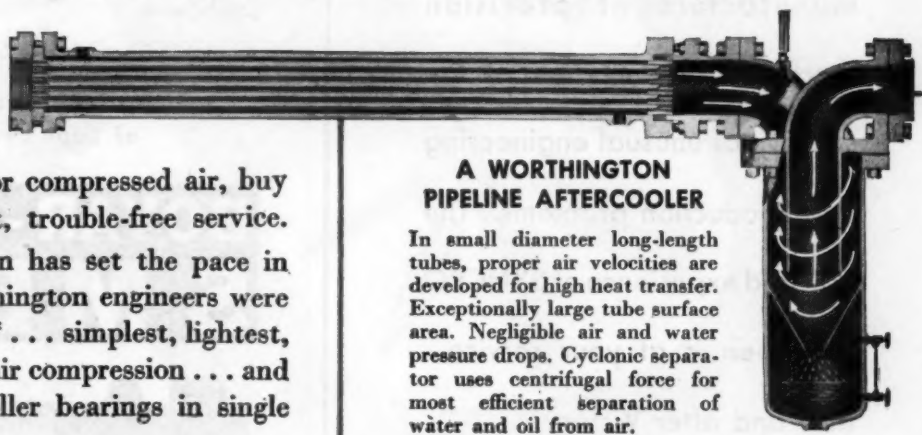
UNIVERSAL ENGINEERING CO.

FRANKENMUTH, MICHIGAN



Compressor BY WORTHINGTON

For Dependable Air at Lowest Cost



A WORTHINGTON PIPELINE AFTERCOOLER

In small diameter long-length tubes, proper air velocities are developed for high heat transfer. Exceptionally large tube surface area. Negligible air and water pressure drops. Cyclonic separator uses centrifugal force for most efficient separation of water and oil from air.

No other compressor will outperform a Worthington

Whatever your need for compressed air, buy Worthington for efficient, trouble-free service.

For years, Worthington has set the pace in compressor design. Worthington engineers were *first* with Feather Valves* . . . simplest, lightest, most effective valves for air compression . . . and *first* with anti-friction roller bearings in single horizontal compressors.

In many cases, in all kinds of manufacturing plants from coast to coast, the type "HB" Worthington Air Compressor shown above has been in operation, without major adjustments, for more than a quarter of a century.

Write for complete data—installation photos—in Bulletin L-640-B1. AC 4-6

* Reg. U. S. Pat. Off.

WORTH BEHIND THE NAME WORTHINGTON

WORTHINGTON PUMP AND MACHINERY CORPORATION, HARRISON, N. J., U. S. A.

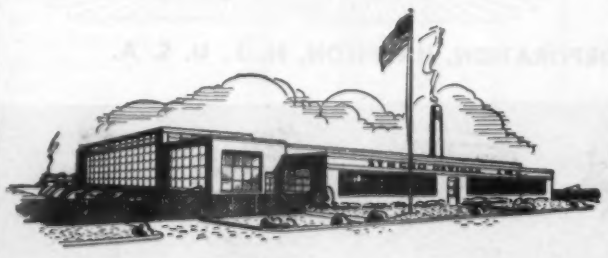
Consult

SYNCRO

the HOME of Precision and Production

SYNCRO specializes in the manufacture of precision machined products and in the solution of unusual engineering and production problems. The skill and experience of SYNCRO craftsmen is at your service—now and after Victory.

SYNCRO DEVICES, INC.
Ferndale 20, Michigan



BOYAR-SCHULTZ

COPPER HEAD LAPS

SAVE TOOL ROOM TIME . . .
SAVE LAPPING TIME . . .
DO A BETTER JOB . . .

Consider the tool room time saved when you use Copper Head Laps instead of making them in your own shop. That is not the only saving . . . Copper Head Laps never wear out. The only wearing part is the inexpensive copper sleeve. Adjustment feature permits maintaining correct lapping size till sleeve is work. Machined heads and carefully cut threads sized sleeve.

Available from stock in Standard sizes—$1/8$" to $2\frac{1}{2}$".

Write for Circular Showing Prices of Laps and Extra Sleeves

BOYAR-SCHULTZ SMB BOLTS

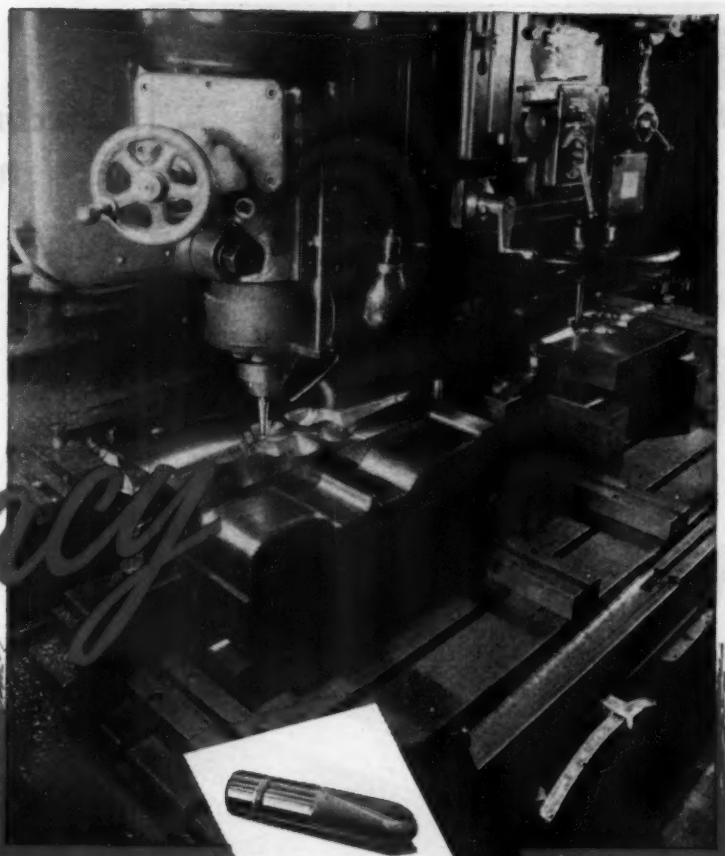
It Is CHEAPER To Use GOOD BOLTS Than To Repair Expensive Machines

Heat treated alloy steels make them TOUGH for heavy work. Machined Heads and carefully cut threads make them ACCURATE for the most exacting tool room work. Heads are machined square with bodies, presenting a clean, flat surface to the T-Slot. Work is held tightly under heavy machine cuts. Close adjustments are possible.

For best results use SMB Nuts and Washers. They are specially made for use with SMB Bolts.

Write Us For Our New Bolt Circular

BOYAR-SCHULTZ CORPORATION
2109 WALNUT ST. CHICAGO 12, ILL.



GEAR YOUR CUTTING

TO T-J

Accuracy

WITH MORE WORK BETWEEN GRINDS!

Give your cutting operations the extra measure of *speed, accuracy* and *efficiency*... assured with T-J DIE SINKING MILLING CUTTERS!

Shop men find they get more work between grinds with T-J Cutters. Designed and built *right* for sturdiness... ability to hold a sharp edge longer... and carry less breakage percentage. Made from a standard, extremely high grade steel... assuring extra strength, wear resistance and uniformity. Backed by long years of T-J Leadership in building better cutters! Write for catalog.

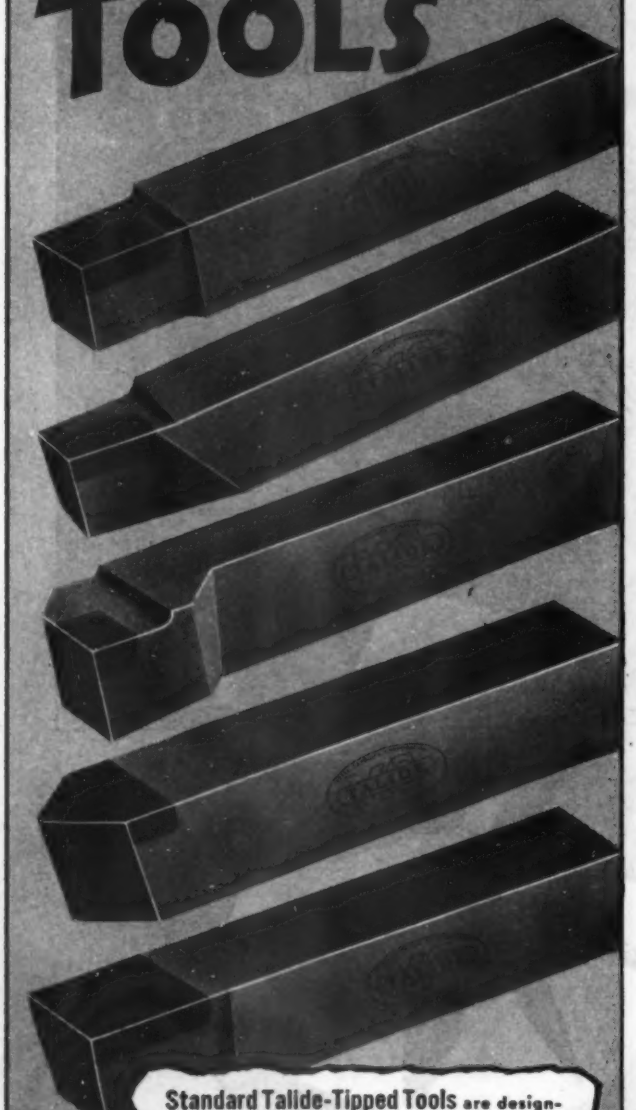
The Tomkins-Johnson Co., Jackson, Mich.

FOR TOUGH JOBS SPECIFY T-J

TOMKINS-JOHNSON

DIE SINKING MILLING CUTTERS

TALIDE-TIPPED TOOLS



Standard Talide-Tipped Tools are designed for fast roughing and precision finishing operations on all types of steels, cast iron and non-ferrous metals. Available in both Tungsten Carbide and Tungsten-Titanium Carbide compositions, Talide Tools give longer run, higher speed performances on all kinds of machining operations including turning, boring and facing. Send for catalog No. 43-T.

TIPPED WITH TALIDE TUNGSTEN CARBIDE

METAL CARBIDES CORPORATION YOUNGSTOWN, OHIO

METAL CARBIDES CORPORATION
YOUNGSTOWN, 5 OHIO
TUNGSTEN CARBIDE TOOLS · DIES · WEAR PARTS

Accuracy lasts longer with new J-83 Gage Block Set!

TWO wear blocks of tough tungsten carbide protect the surfaces of the 81 alloy steel blocks. That's why the Jansson J-83 set of precision gage blocks stays accurate longer. Makes 120,000 gages in steps of .0001" from .200" to over 12". Skilled Jansson workmanship assures accuracy to .000008", .000004", or .000002".

Write for free copy of Jansson's 60-page "Handbook of Precision Measurement." Enthusiastically praised from coast-to-coast. For precision gage blocks, calipers, height gages, sine bars, tri-square, and special gages see Jansson, "The House of Precision", first.

JANSSON GAGE COMPANY

GLENDALE AVE. • DETROIT 23, MICHIGAN

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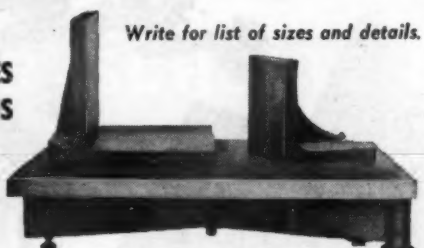
SURFACE PLATES & ANGLE IRONS

available in a wide range of sizes

Write for list of sizes and details.



Surface Plates and Inside and Outside Angle Irons normalized, first grade gray iron, nickel iron, or meeninite castings. Can be furnished finished, machined, hand-scraped or ground.

H. & H. MACHINE TOOL CO., Waltham, Mass.

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Investigate the possibilities offered you through advertising in the CONTRACT WORK SECTION!

For details, write

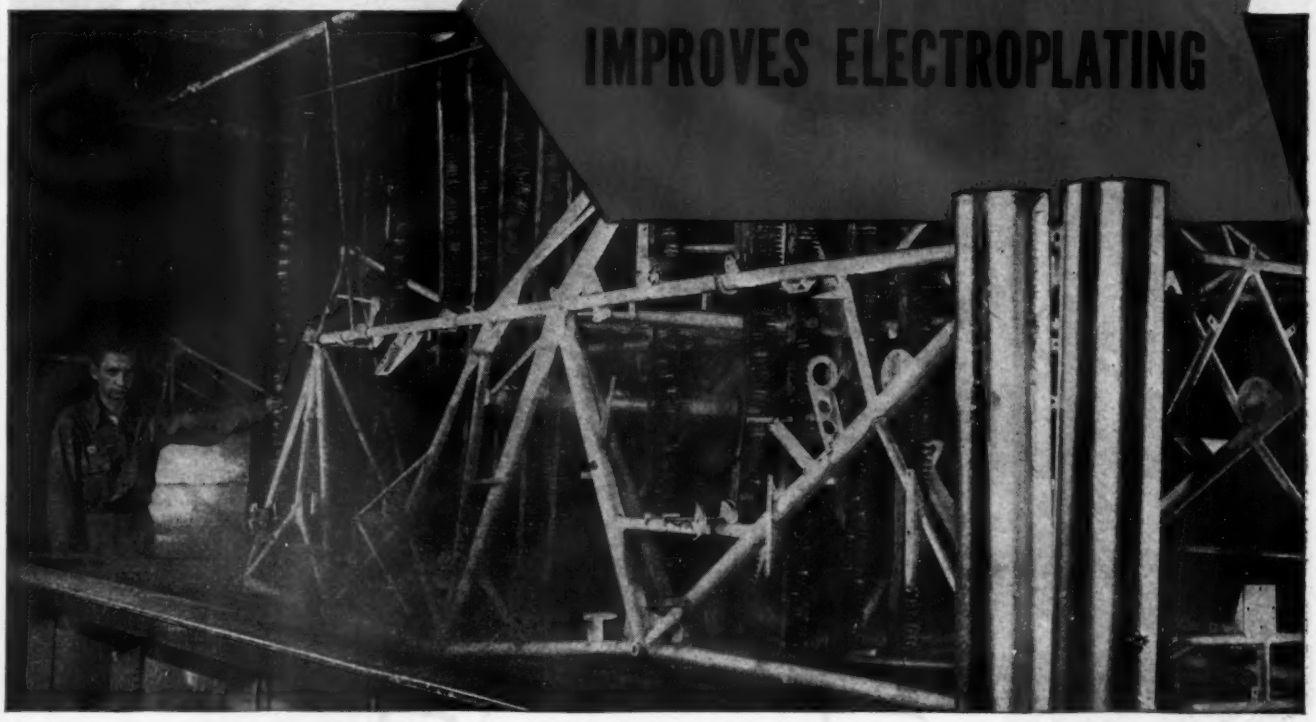
DEPARTMENTAL STAFF

American Machinist, 330 W. 42nd St., New York 18, N. Y.

Prosolv *B*

offers outstanding advantages

NEW TURCO CLEANER IMPROVES ELECTROPLATING



APPROVED FOR THE BULLARD-DUNN DESCALING PROCESS

Equally effective in still tank and electro-cleaning

So positive are the advantages of Turco Prosolv *B* that prominent electroplaters have switched to this new cleaner immediately following tests *although they had considered satisfactory the materials they had been using.*

Turco Prosolv *B* insures the chemical and physical cleanliness that is essential to 100% bonding to steel of zinc, cadmium, chromium and other plate. It removes every trace of oil, grease, smut, paint and rust preventive compound. It contains no soap; leaves no deposit. Rinsing is complete, even though parts may have dried.

A highly concentrated product, Turco Prosolv *B* is 100% active. Every particle works; there is no waste.

As this new cleaner is effective in both still tank and electro cleaning, it simplifies stocking and plant procedure where both processes are employed.

Try Turco Prosolv *B* for stripping tin deposits formed during the Bullard-Dunn descaling process. A standard cleaning tank may be used for this. Call the Turco Field Service Man for details on this specially formulated electro and still tank cleaning material which is doing such a notable job the nation over. Write today.

Follow Prosolv *B* with Turco Descaler This second step in preparing steel for plating is as necessary to a perfect job as the primary cleaning operation in Prosolv *B*. Any rust, mill, welding or heat-treat scale will prevent bonding of plate. Turco Descaler removes these without attaching the base metal. Thus the combination of Turco Prosolv *B* and Descaler insures quality plating at low cost. Let us furnish full details.

Rust Bar treatment for unplated portions. Partially plated parts, if treated with Turco Rust Bar, are well protected from corrosion during indoor storage although subjected to severe conditions. A thin film of Rust Bar is resistant not only to airborne water vapor, but also to corrosive gases and other types of corrosive agents.

TURCO

Write Dept. AM-7

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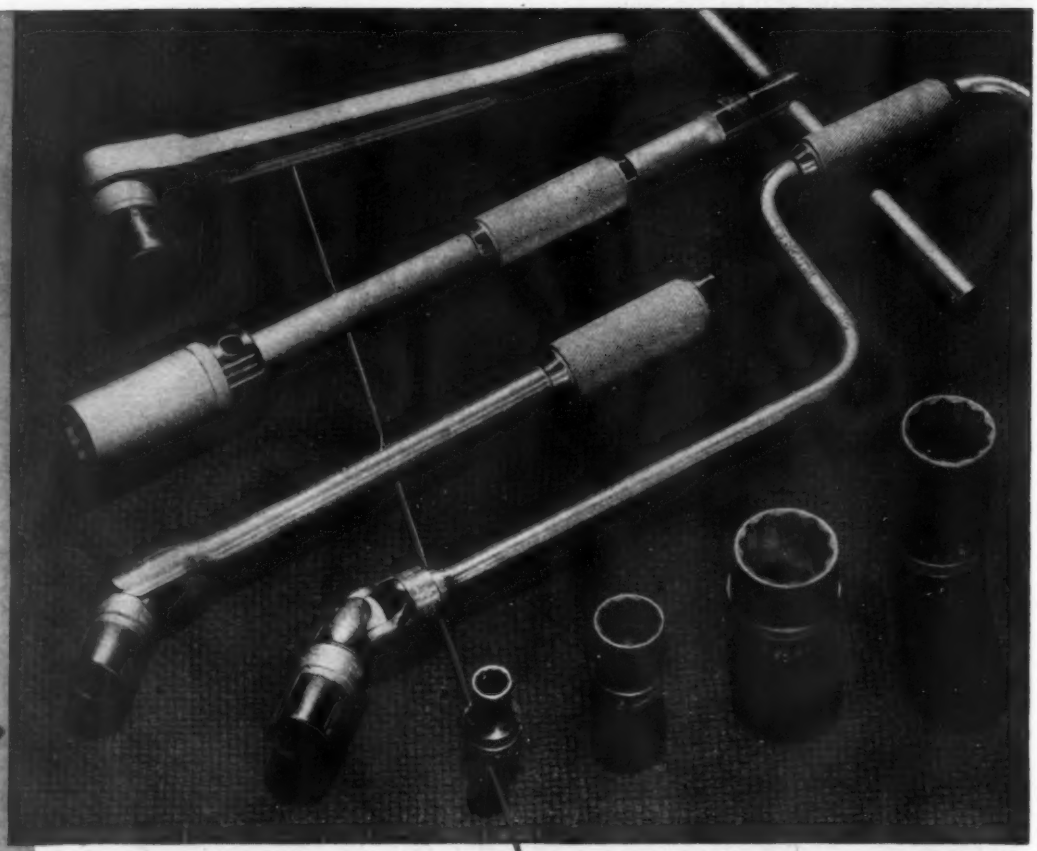


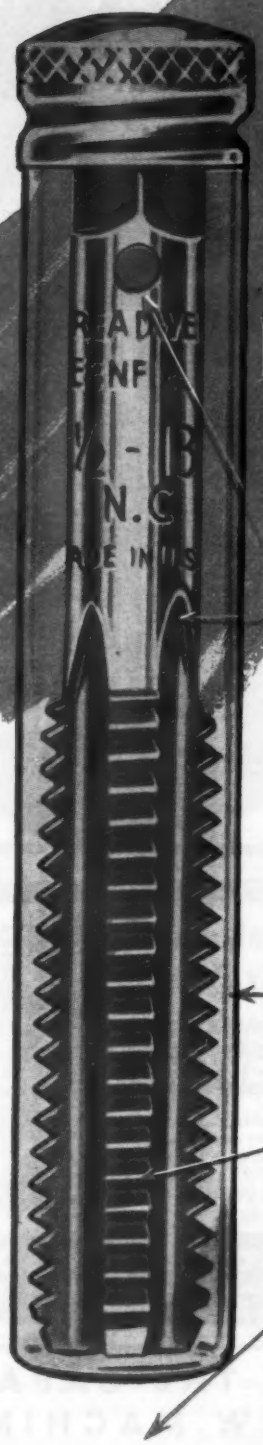
Tools of Freedom . . .

TODAY, the tools that lend speed and skill to the genius of American labor are building the fighting machines which will surely liberate Europe's enslaved millions. Tomorrow, these same . . . and even finer tools . . . will build those thousands of new and better things that are the fruits of willing effort . . . the heritage of a free and happy people.

J. H. Williams & Co.,
Buffalo 7, N. Y.

WILLIAMS
DROP-FORGINGS AND DROP-FORGED TOOLS

Points OF DISTINCTION FOR *"Taps of Distinction"*



Threadwell Taps' distinctive performance—a fact you can prove only on your own threading operations, but made certain by superior craftsmanship and production control. For example, all *Threadwell Taps* have *polished flutes* to provide extra protection against chip clogging and consequent tap breakage.

Threadwell Tap "i-dot-ification"—a sure, quick, distinctive way to pick the right tap for the job—*red* dot for cut thread, *white* for commercial ground, *blue* for precision ground.

Threadwell Tap-capsule—a transparent plastic, metal capped tube protecting every *Threadwell* ground thread tap. You select the right tap before you unwrap.

Threadwell greaseless rust-proofing—clean and dry to handle, always spic and span and ready-to-use.

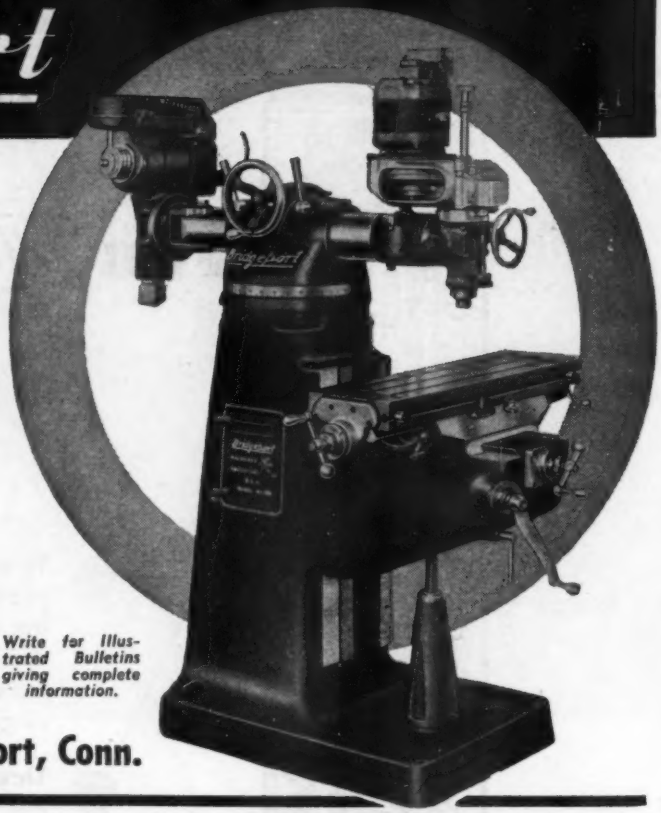
Threadwell Tap service—your order for taps gets *personal attention* from *Threadwell* and from your *Threadwell* distributor. You'll appreciate the difference once you sample *Threadwell* service.

DISTRIBUTORS IN LEADING INDUSTRIAL CENTERS THROUGHOUT AMERICA
EXPORT STOCKING DISTRIBUTORS
CANADA Bridge Machinery Co., Montreal
ENGLAND Skylux Ltd., London
and
John H. Graham and Co., Inc.
THROUGHOUT THE WORLD

Threadwell
SINCE 1902
"TAPS OF DISTINCTION"

THREADWELL TAP AND DIE COMPANY • GREENFIELD, MASSACHUSETTS, U. S. A.

Announcing a new shaping attachment by Bridgeport



This new sturdy accurate attachment — for which a tremendous demand has existed — is at last in production and available for use on existing Bridgeport Turret Milling Machines now in the hands of users. It can also be mounted on all types of milling machines and on special production equipment.

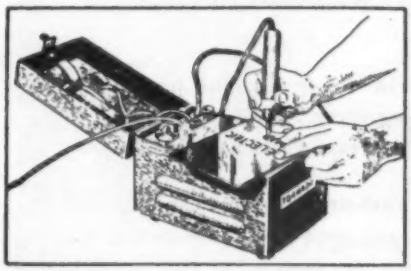
As applied to "Bridgeport" machines it is mounted on the back end of overarm and can be set for operation at all angles. It provides a fast, convenient and practical means for shaping large and small die and mold work. It is extensively used also on intricate production jobs where slotting operations are necessary.

The Bridgeport Turret Milling Machine — a machine of outstanding versatility and flexibility — features the Bridgeport Milling Attachment which enables it to handle drilling, boring and milling at all angles without changing set-up of work. All modern features of the conventional milling machine are available which with this attachment makes the Bridgeport a universal machine of unparalleled utility.

Bridgeport High Speed Milling Attachments, like the Shaping Attachment, can be mounted on milling machines of all types and on many types of special production equipment.

Write for Illustrated Bulletins giving complete information.

THE BRIDGEPORT MACHINES, Inc., Bridgeport, Conn.



Protect Valuable Tools— Mark them with TORNADO Electric Etchers and Writing Tools

TORNADO Electric Etchers and Writing Tools mark everything of value that might be lost, misplaced or stolen. They mark iron, steel, brass, bronze, plastics, glass, etc. Convenient, easy and economical to use.

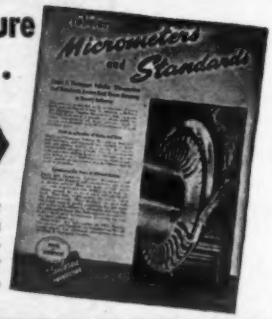
WRITE FOR DETAILS.

BREUER ELECTRIC MFG. CO., 5084 N. Ravenswood Ave., Chicago, Ill.

How to Accurately Measure Large* Unwieldy Parts...

* Up to 168"

...is explained in this **FREE BOOKLET**



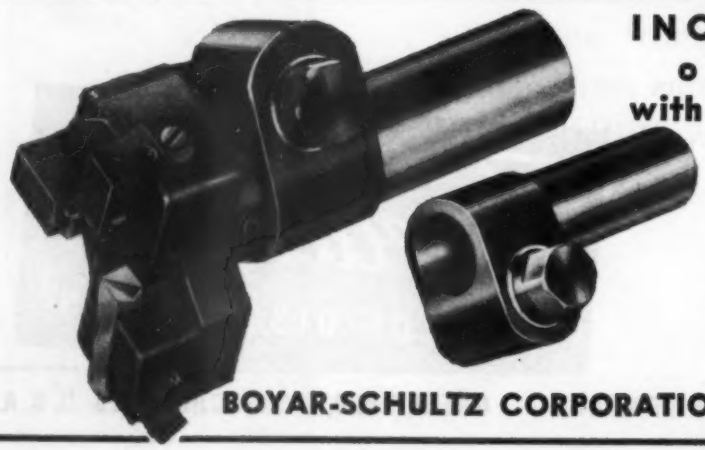
Write for your copy today. Learn how D&T Tubular Micrometers and Standards can be applied as accurately to the measuring of work up to 168" as ordinary micrometers are to small precision parts.

Ask for Bulletin No. D-200.

Davis and Thompson Co.

Mfrs. of Machine Tools and Micrometers

6411 W. Burnham St. • Milwaukee 14, Wisconsin



INCREASE THE CAPACITY of SCREW MACHINES with BOYAR - SCHULTZ Precision MODEL H ADAPTER

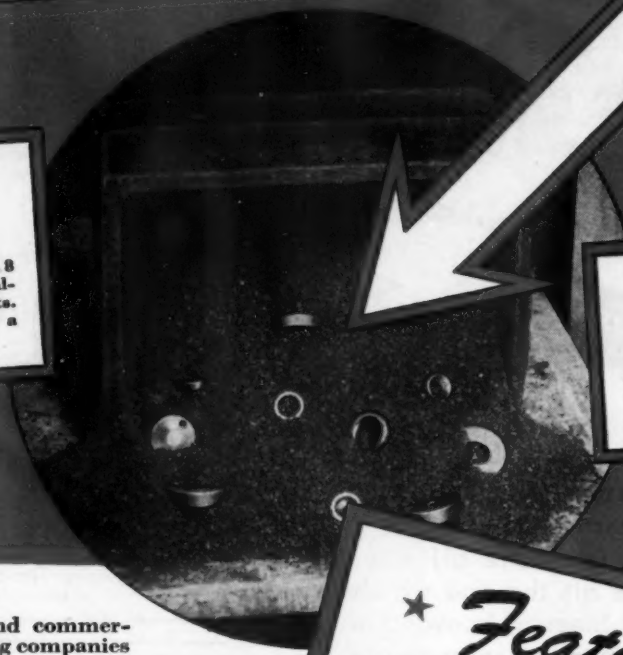
Built to last . . . a permanent Tool of special design, made with the same precision workmanship that has so long characterized other Boyar-Schultz Screw Machine Tools.

With this Model H Adapter, more than one size tool can be used on a screw machine of a given size greatly increasing the machine's flexibility.

Write for New Circular

BOYAR-SCHULTZ CORPORATION, 2109 Walnut St., CHICAGO 12, Ill.

STEP-UP YOUR PRODUCTION CARBURIZING with Park No. 8 N.B. CARBURIZER



PROVE *it to Yourself!*

Prove to yourself that Park's No. 8 carburizer is superior to charcoal-coke compounds for small parts. Send in your order today for a trial run.

IMMEDIATE DELIVERY!

All orders for Park No. 8 carburizers can be shipped the same day they're received.

Manufacturers and commercial heat treating companies have been unanimous in their claims that Park No. 8 non-burning carburizer is far superior to other carburizing compounds for the production carburizing of small parts.

They base their claims upon the satisfactory results obtained in using Park No. 8 N.B. carburizer. They have found the fine texture of Park No. 8 to be ideal for thoroughly covering the smallest parts, thereby insuring uniform case depths at all times. A saving in labor was also effected by the elimination of:

1st: Hand packing operations;

2nd: Frequent changing of the carburizer (because No. 8 is non-burning it can be used over and over).

These advantages plus the added features listed at right prove that you can realize definite savings in carburizing small parts when you use Park's No. 8 N.B. carburizer.

For complete information and prices about Park No. 8 carburizer wire or write us today.

★ Features ★

1. NO REMIXING NECESSARY. Park No. 8 can be used over and over.
2. NO BURNING LOSS. Park No. 8 does not burn after dumping.
3. NO CHANCE TO EXPOSE PARTS THROUGH SHRINKAGE. Due to low initial shrinkage of Park No. 8 exposure of parts is not evident.
4. NO INDIVIDUAL HAND PACKING with Park No. 8. Parts can be shoveled into box.
5. TIME SAVED IN EMPTYING BOXES. Can be emptied by placing fine screen over drum and dumping.
6. UNIFORMITY OF RESULTS. Coke build-up eliminated, all parts covered by free flowing Park No. 8.
7. FASTER COOLING OF POTS. Hours saved by non-burning Park No. 8.
8. TIME SAVED IN CLEANING COMPOUND. Seldom necessary to clean Park No. 8.

Park

PARK CHEMICAL CO.

DETROIT MICHIGAN

● Liquid and Solid Carburizers ☆ Cyanide, Neutral and High Speed Steel Salts ☆ Lead Pot Carbon ☆ Charcoal ☆ Coke ☆ No Carb. ☆ Carbon Preventer ☆ Quenching and Tempering Oils ☆ Drawing Salts ☆ Metal Cleaners ☆ Liquid Grain Cement

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Don't guess at Cutting Fluids

A cutting fluid is measured by its performance on a particular job. Yet it isn't necessary to try one oil after another until you hit the one which performs best. Engineering knowledge based upon experience can expedite your selection.

D. A. Stuart Oil Co. offer you the cooperation of skillful, trained engineers. Experience since 1865 has developed an insight into the fundamentals of cutting and grinding fluid application which is available to you with every drum of Stuart Oil.

There is a Stuart service engineer near you ready to help eliminate guessing at cutting fluids. Why not use him?

Having difficulties in thread grinding, gear grinding, form grinding? Investigate Stuart's grinding oils, including Thred Cut 99 grinding oil, SuperKool 81X, and Excelene.
Our new booklet, *"Grinding With Oil,"* tells the story. Write for a copy.

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ESTABLISHED 1865
Warehouses in Principal Metal-Working Centers

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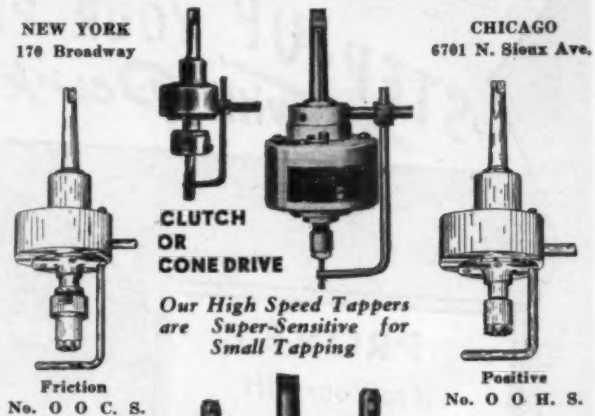

CLUTCH OR CONE DRIVE

Our High Speed Tappers are Super-Sensitive for Small Tapping

Friction
No. O O C. S.

Positive
No. O O H. S.

Style B Positive Stop Holds Work Down

Style C Graduated Adjustable Safety Friction

DRILL PRESS TURRET

Style D-E with Quick-Change Tool Holders to Drill, Tap and Set studs, etc., without moving work, or stopping or reversing machine. Individual friction adjustments in each tap-holder. If required.

Also, Opening Die-Heads; Opening Stud-Setters; Friction Screw-Drivers and Nut-Setters, etc.

ADJUSTABLE SCREW THREAD GAGE

Each gage in case with 6 rods and anvils to take all A.S. sizes from 1/8" to 5/8" O.D. and from 10 to 32 threads per inch.
Price $60.00 net.

Gage for one A.S. size, up to 5/8".
Price $26.00 net.

EDDY SERVICE GAGE STYLE 23

Go, No Go and Selvage

Each gage, with complete set of gaging rods in case to gage	Net
Between 0" and 3/4" (12 rods)	$25.00
Between 1/4" and 1" (12 rods)	26.00
Net price of one Style 23 gage with one set of 3 rods to gage any 3/16" step	Net
Between 0" and 3/4"	$14.00
Between 0" and 1"	15.00

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at Kenmore Sq. BOSTON
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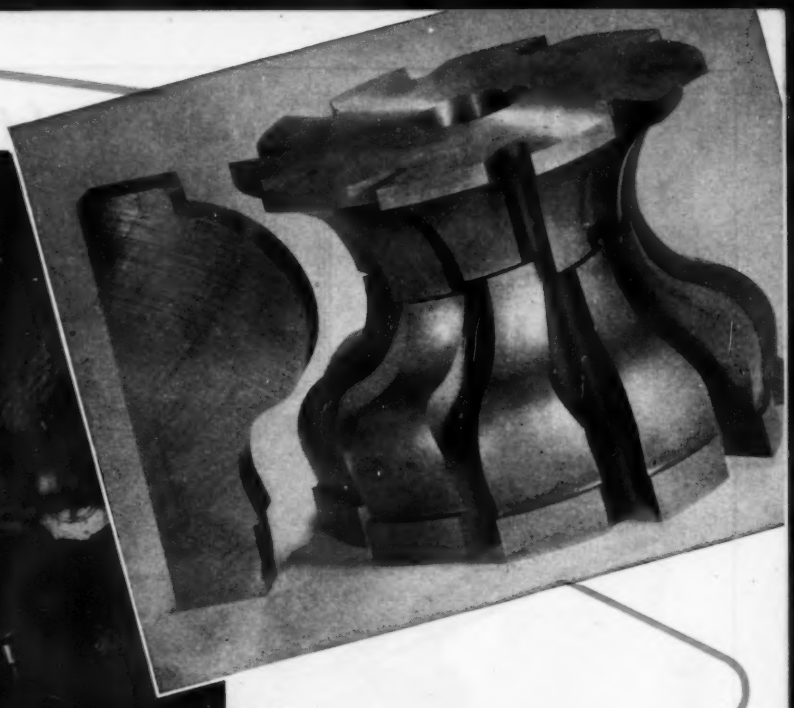


EXPERIENCE... THE ESSENTIAL INGREDIENT IN FORM CUTTERS!

ILLINITE PRECISION METAL CUTTING TOOLS

Ground Hobs

Shaper Cutters

Fundamentally it is engineering ability which sets any manufacturing organization apart from its contemporaries.

Milling Cutters

Ground Form Tools

Broaches

Special Tools... Gear Measuring Machines... Gear Measuring Blocks... Die Filing Machines

Every profile milling job has its own peculiar features, as different from plain milling as a curve is different from a straight line. Experience, not formula, furnishes the answer to the problems presented by such special applications.

From their years of close contact with leading metal working companies, Illinois Tool Engineers offer you the advantage of a vast experience in all methods of metal cutting. They can assist you in making the most efficient and profitable use of form relieved cutters or any other proven milling technique.

OVERNIGHT TO ALL AMERICA ... FROM THE HUB OF AIR TRANSPORTATION

ILLINOIS TOOL WORKS

2501 N. KEELER AVE. CHICAGO 39, ILLINOIS

In Canada: Canada Illinois Tools, Ltd., Toronto, Ontario

MANUFACTURERS OF METAL CUTTING TOOLS AND SHAKEPROOF PRODUCTS

The HARTFORD Quick-Acting MILLING VISE

Investigate Today!

. . . the tool for speeding production and maintaining accuracy . . .

Because of its power, speed, accuracy and strength, the "HARTFORD" has proved a valuable aid to production milling. Any operator, with a little practice, can quickly learn to manipulate it with one hand.

Two handles control all operations. The lower cam-faced one provides quick opening and quick return and the top eccentric lever exerts a tremendous pressure for holding the work. Upon releasing the eccentric binding lever, a quarter turn of the cam lever opens the movable jaw approximately ⅞"—permitting quick and easy chip clearance and instant release of work.

The movable jaw in the "HARTFORD" is in the position usually occupied on screw type vises by the solid jaw. Perfect jaw alignment as well as a construction which is practically indestructible are assured.

Screw holes of the jaws of the "HARTFORD" are interchangeable with those of the No. 2 B&S Vise. Replacement parts can be furnished promptly from stock.

SPECIFICATIONS

MADE IN PLAIN and SWIVEL TYPES
Width of Jaw—5"
Depth of Jaw—1 3/16"
Max. opening (Plain Jaw)—2⅝"
Max. opening (Swivel Jaw)—2¼"
Weight 40#
Dimensions (overall) — 13" long — 8" wide, 5" high

The HARTFORD SPECIAL MACHINERY CO.
Hartford, Conn.

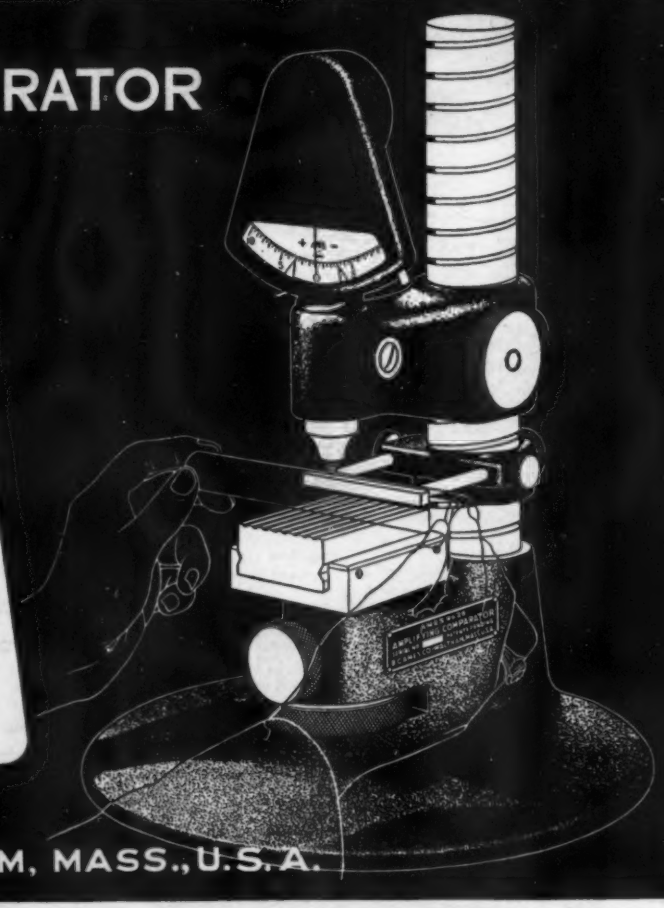
AMES No. 26 COMPARATOR

This precision built Comparator stands solidly on a large diameter base and is heavily constructed to eliminate all spring. It is intended for use in making comparisons of duplicate parts for size and will indicate the most minute variations on the dial, with ability to give repeat readings.

The cast iron base supports the steel upright column, which is grooved to provide an adjustable stop for the indicator bracket. Fine adjustment of indicator is made by moving dial with outside lever. The adjustable stop assembly helps to locate work on the hardened and ground anvil.

SPECIFICATIONS

Total height 15". Base diameter 11".
Total measuring capacity 6"
Fan Head total range .002"
Distance from contact to front of Post 3½"
Anvils 2⅛" x 3¼". Special anvils to order
Approximate weight 40 pounds



B. C. AMES CO., WALTHAM, MASS., U.S.A.

ONLY ONE STOP COUNTERSINK WITH A STORY LIKE THIS

Schrillo maintains complete factory rebuilding service —assures a tool comparable to the original unit.

Patent Applied for

Send for complete information. Literature on complete Schrillo line is available. Write on your firm letterhead, please. Schrillo Aero Tool Engineering Co., 8715 Melrose Avenue, Los Angeles 46, California

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QUADRO *Precision* LIVE CENTERS

Manufactured in all tapers and sizes.

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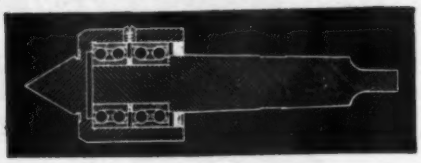

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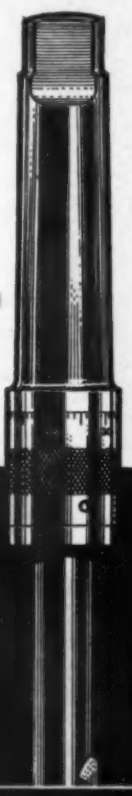

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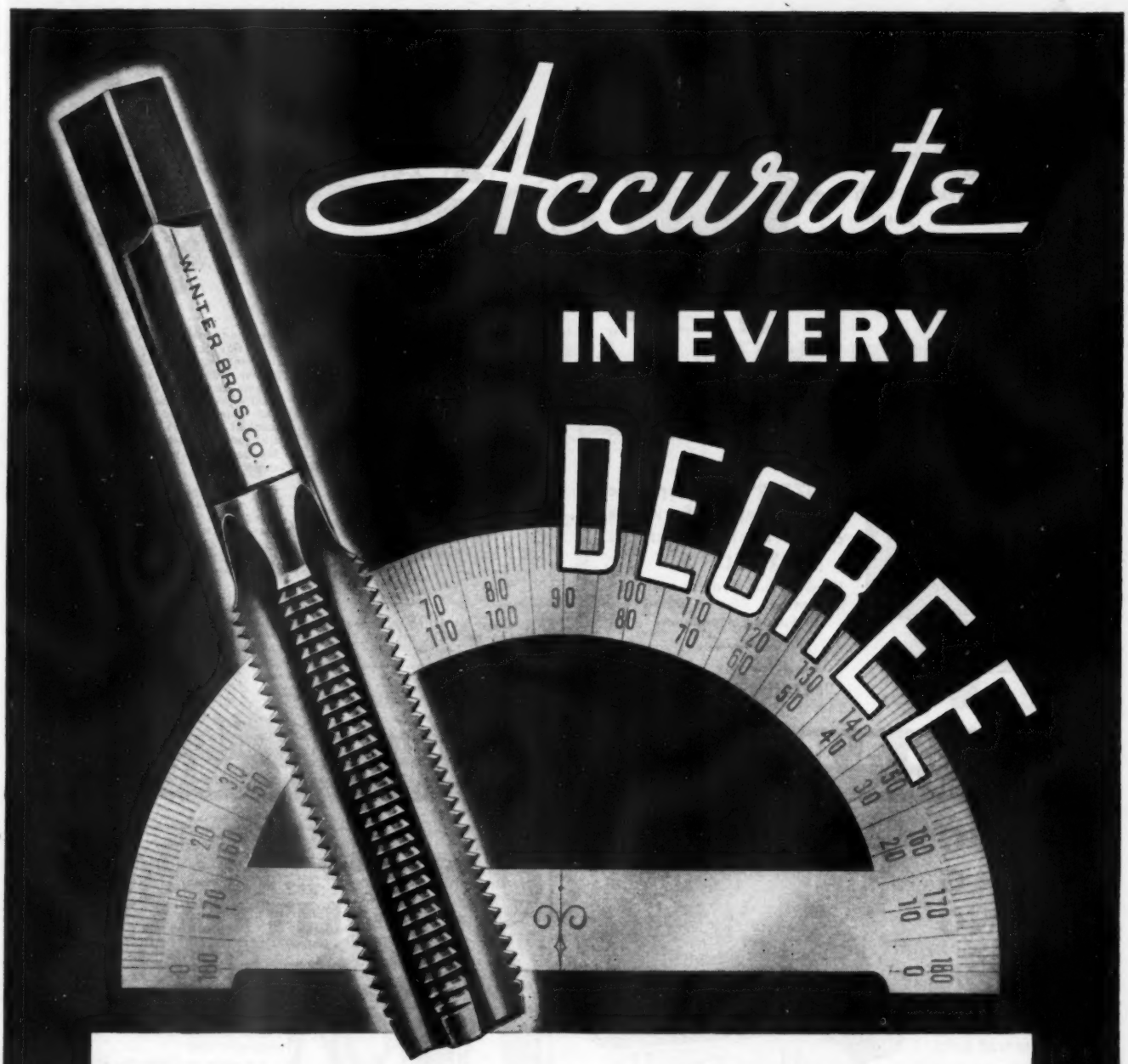

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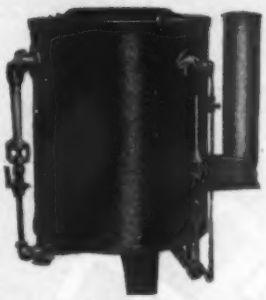

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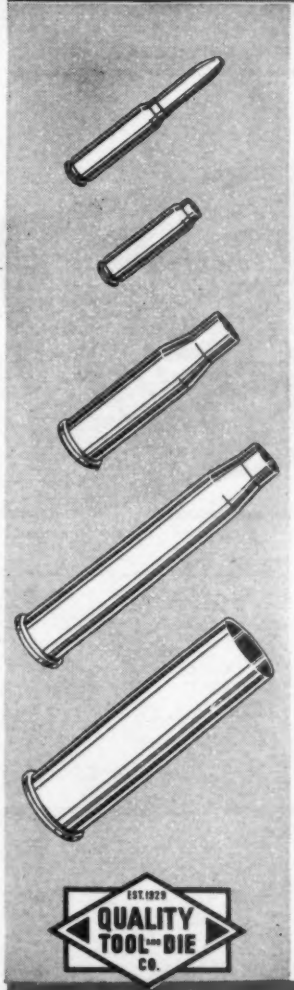

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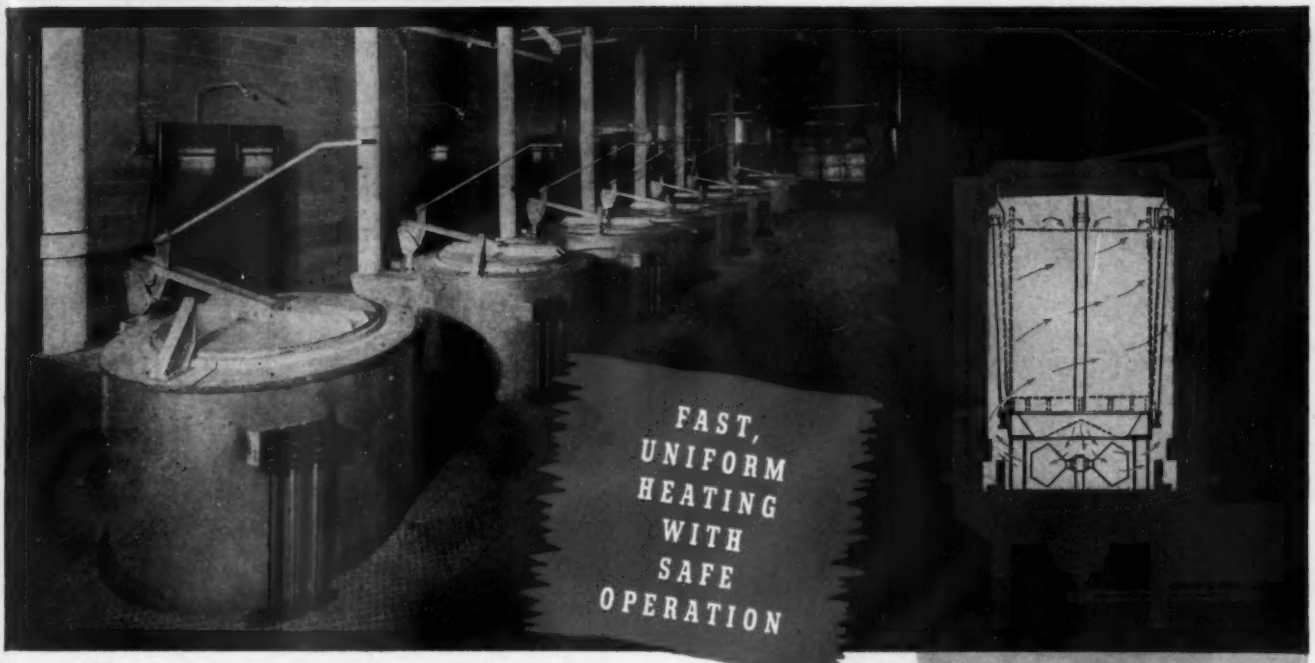

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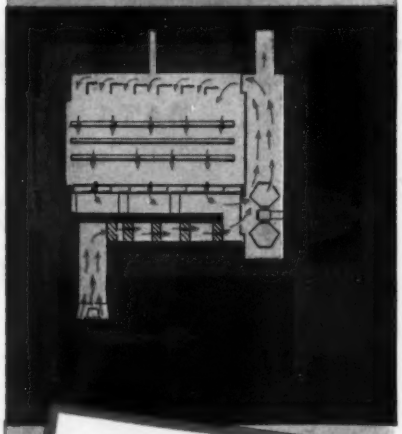
Cross sections shown above (Pit Type) and below (Oven Type) incorporate arrows to indicate the thorough circulation of hot gases within the furnace.



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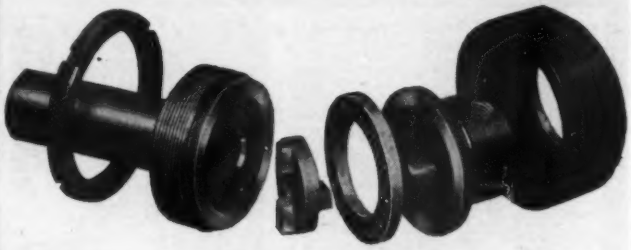

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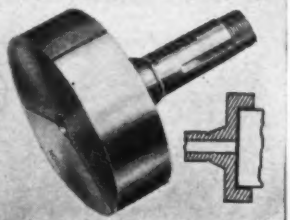

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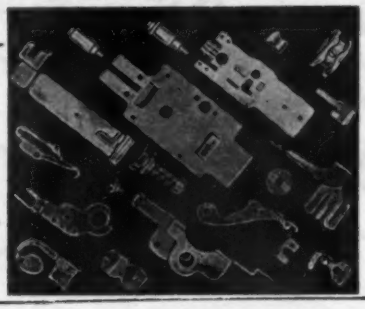

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SEARCHLIGHT SECTION

(Continued on page 318)

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(Continued on page 318)

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Men wanted for war work today who will stay with company in postwar period. Hourly rate.

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Must comply with WMC regulations.

Apply by letter.

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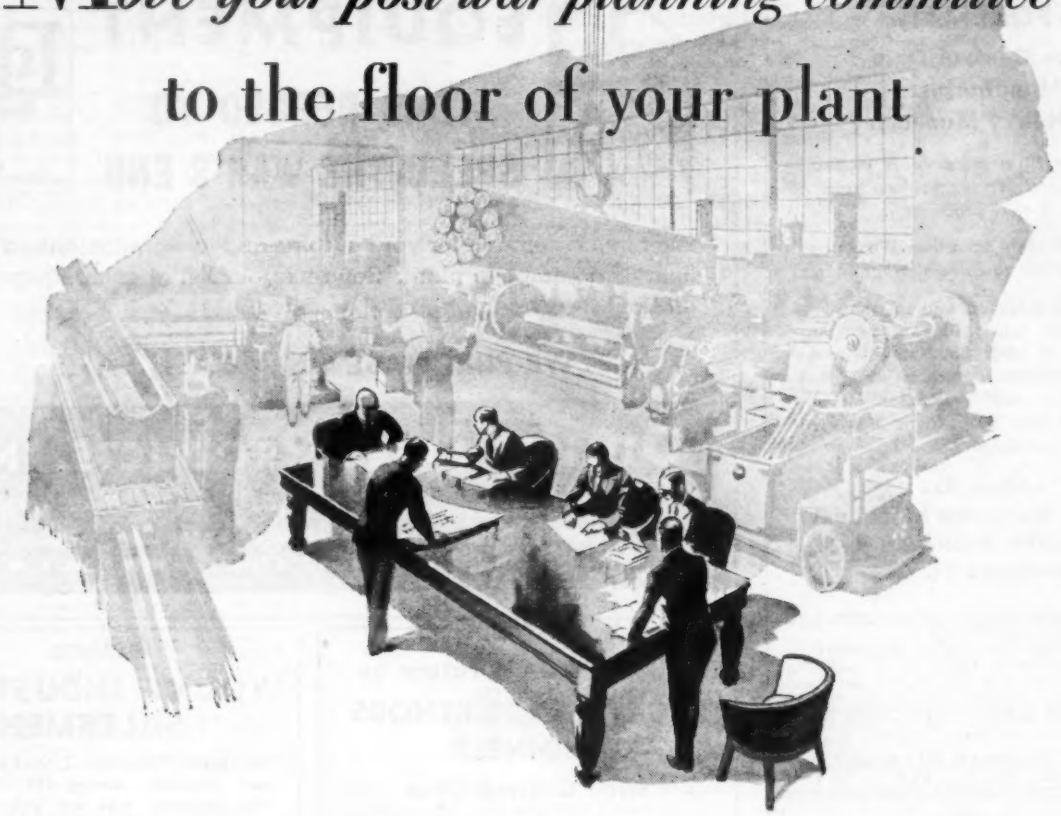
Move your post-war planning committee to the floor of your plant



Not literally, of course, but objectively. For there on the floor of your plant is the nucleus of the equipment on which your reconversion to consumer goods production will depend.

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200 NATIONAL BLDG.	11611 SO. ALAMEDA	2280 WOOLWORTH BLDG.
SEATTLE 4, WASH.	LOS ANGELES 2, CALIF.	NEW YORK 7, N. Y.

WANTED

Mechanical Designing Engineer

Small machine shop in Newark, N. J., desires to make contact with high type of man that would be interested in purchasing all or part and capable of making designs for miscellaneous machinery that will be encountered in post war work, also to build up business for future. Statement of availability required.

P-865, AMERICAN MACHINIST
330 West 42nd St., New York 18, N. Y.

WANTED

SHOP FOREMAN

One with machine tool experience. Small shop with very good Post-War prospects. Excellent chance for progressive man with the necessary ability. Statement of availability required.

P-888, AMERICAN MACHINIST
330 West 42nd Street, New York 18, N. Y.

A Place with a Future as

PROCESS and METHODS ENGINEER

with Central Ohio Manufacturer of Heavy Machinery

Must have had 5 or more years experience and a record of accomplishment.

We are a long established company and already have our postwar products and markets waiting as soon as war contracts are completed.

If you are qualified and interested in an assured future with a progressive company that intends to keep on improving its processes and methods.

Address Box

P-874, American Machinist
520 NORTH MICHIGAN AVE.
CHICAGO 11, ILL.

WANTED

YOUNG INDUSTRIAL SALESMEN

We think there are 2 young mechanical engineers among the readers of this magazine who are itching to develop into top notch industrial sales engineers. They may or may not be selling industrial lines now . . . but they do want to carve an important and permanent niche for themselves in the postwar period. If you are this man we want to talk with you. We are an established, progressive, sales and engineering-minded, medium sized manufacturing concern . . . the leader in our field. Replies will be treated confidentially. Address

SW-884, American Machinist
520 NORTH MICHIGAN AVE.
CHICAGO 11, ILL.

POSITIONS WANTED

(Continued from page 316)

MANUFACTURING EXECUTIVE seeks new connection as Factory Manager or Executive Engineer with firm producing intricate mechanical-electrical devices. Experience includes 22 years with prominent business machine and industrial instrument companies. Proven record as good organizer and producer. PW-856, American Machinist, 68 Post St., San Francisco 14, Cal.

SEASONED WORKS manager and chief production engineer is immediately available for a permanent position with a reliable firm. Position must afford plenty of responsibility both for the present and a good postwar future to a man with broad shop and organization experience in modern production methods. Married, one son. Perfect knowledge of useful foreign languages. Salary not less than $12,000 per annum required. Record and references on request. PW-875, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

MECHANICAL ENGINEER, age 34, desires permanent position in charge of designing and building factory equipment. Will locate anywhere in New England. Ten years experience with two leading electrical manufacturers doing this type of work. PW-890, American Machinist, 330 W. 42nd St., New York 18, N. Y.

PATENT ATTORNEY—Northern California; electrical, mechanical, civil, engineering fields. Available on salary part time. Several years experience; patent soliciting and in U.S. patent office, construction, and design engineering. PW-891, American Machinist, 68 Post Street, San Francisco 14, Cal.

WANTED

MACHINE AND TOOL SALESMAN

EXCEPTIONAL OPPORTUNITY FOR HIGH GRADE EXPERIENCED MEN TO EXPAND INCOMES HANDLING HIGH QUALITY WELL KNOWN CUTTING OILS AND LUBRICANTS IN ADDITION TO THEIR OWN LINES. ATTRACTIVE COMMISSION. *WRITE COMPLETE DETAILS.*

SW-885, AMERICAN MACHINIST
330 W. 42nd St., New York 18, N. Y.

WANTED — QUALITY PRODUCTS

SALES ENGINEERS, long established PHILADELPHIA TRADING AREA, experienced Parts and Specialties, want additional exclusive representation quality products, direct Industrial users (production or maintenance).

RA-886, AMERICAN MACHINIST
330 West 42nd Street, New York 18, N. Y.

PATENT ATTORNEY

PATENTS, COPYRIGHTS, Booklet, "General Information concering Inventions and Patents" and "Fee Schedule" sent without obligation. Established 1915. Lancaster, Allwine & Rommel, Suite 453, 815-15th St., N.W. Washington 5, D.C.

CONTRACT WORK

MANUFACTURING FACILITIES WANTED: Forging, cold-heading or punch press shop wanted to make several million pocket knife bolsters for us. Write for samples. Union Cutlery Co., Inc., Olean, New York.

WANTED:

6 or 8 Spindle Bullard Mult-au-Matics (Machine must be in running condition)

NYLEN PRODUCTS COMPANY
St. Joseph Michigan

ADDITIONAL WANTED ADS ON PAGE 326 — AUCTION AD PAGE 327

FRANK FACTS about Falk

Better performance, quantity and quality of work can be obtained by installing "FALK" GOOD USED MACHINE TOOLS on the job because:

"FALK" STOCK — A modern stock, with every item owned by "FALK" and in our warehouse or enroute. Shipments can be scheduled because "FALK" owns the machines. "FALK" critical inspection is given to every stock item.—Your inspection is welcome under ideal conditions for selecting machine tools.

"FALK SELECTIVE BUYING" — Each "FALK" used machine tool represents our investment of experienced judgment and capital. The high quality of "FALK" equipment reflects the distinct advantage of this policy, with money savings to you.

"FALK" FACILITIES — Modern facilities to operate, rebuild and inspect used machine tools are provided to assure successful operation. Experienced personnel under supervisors with years of experience in our organization.

"FALK" DELIVERY — Time saving delivery schedules arranged and maintained. Convenient warehousing and every required transportation facility.

'FALK" is a responsible source of supply of GOOD USED MACHINE TOOLS. Prices that are low, consistent with quality. Deliveries as promised, with satisfaction guaranteed. Facilities may be expanded or additional production secured NOW with 'FALK" equipment at minimum cost and with maximum results.

THESE MACHINES ARE GOOD BUYS FOR THE MODERN SHOP

AUTOMATICS

Davenport Model "B" Hi. Sp., 5 spd. 9/16" cap. Threading spd., comp., perf. cond.
#0 Brown & Sharpe full Automatic Motorized, Serial 5721
Brown & Sharpe #0 full automatic with plotting attachments (4).
Cleveland Model "A" 7/8" Cap. Motorized Countershaft, full equipment. Oval Pan, serial 11000, good cond. $700.00.

BORING MILLS

100" Niles-Bement-Pond Bor. & Turn. Mill.
Vertical, 48" Gisholt.
Vertical, 52" and 60" Colburn.
Horiz. #36 Landis-Rochester, 3 1/2 Bar Floor Type—Floor Plate 72" x 120".

COMPRESSORS

6 x 8 Bury; 8 x 8 Bury Horizontal.
8 x 8 Sullivan.

DRILLING MACHINES

Weigel 22" backgeared, sliding head, tapping attachment, power feed.
Superior 26" backgeared, sliding head, tapping attachment, power feed.
Avery, 2 & 3 spindle Prentice, 4 spindle.
Henry & Wright, 6 spindle.

RADIAL

4' Arm Cincinnati Bickford.
5' Arm 11" Rd. Col. Cincinnati Bickford.
5' Arm 13" Rd. Col. Cinn. Bick. air clamp.
7' Arm 15" Bickford.

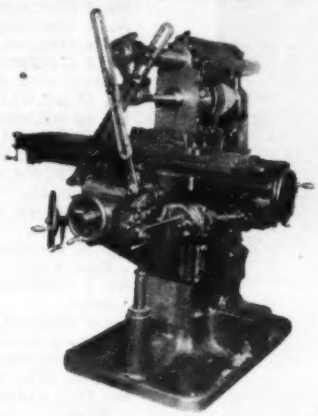
MULTIPLE

Fox #15H 54 spindle hydraulic feed.
Fox #D-31 24 spindle motor drive.
Natco #D-5 8 spindle #1 M.T.
Boley Multiple adj. spd. 1/4" cap. ar. M.D.

GRINDERS

16" Heald Rotary Surface Grinder.
12" Persons-Arter Rotary Surface Grinder.
12" Heald Rotary Surface Grinder also equipt with 9" Dia. Perm. Mag. chuck.
#2 Cincinnati Centerless Grinder, Filmatic.
#12 Greenfield Hydraulic Internal Grinder.
#1 1/2 Cincinnati Universal Tool & Cutter Grinder, Motorized.

MILLING MACHINES



#2 Brown & Sharpe Plain Milling Machine Range—28" Longitudinal travel
10" Cross travel 19" Vertical travel
Table working surface 10" x 45"
No. 3 Cincinnati, High Power, Plain with Vert. Head & Rotary Table, M.D.
No. 5 Cincinnati, High Power, Plain, S.P.D.
No. 4 Cincinnati, High Power, Plain, S.P.D.
No. 3 Cincinnati, High Power, Vertical.
No. 2 Cincinnati, High Power, Plain.
No. 2 Cincinnati, Motorized, Pyramid Col.
No. 2 Brown & Sharpe, Plain (10).
No. 1 1/2 Brown & Sharpe, Plain (2)
#2 Brown & Sharpe vert., single pulley dr.
No. 1 1/2 Valley City Universal, Cone Dr.
No. 1 Brown & Sharpe, Plain (6).
No. 12 P & W Lincoln Type Production (2).
No. 00-A Bickett horizontal hand.
No. 0 Bickett Vertical Bench Miller.
Ames Precision Universal Bench Mill.
P & W 2" Duplex Spline Miller.
Hall Planetary Thread Miller 24"
No. 8 Lees Bradner Thread Miller.

PLANERS

120"x72"x35' Betts, 4 Heads, M.D.*
72"x72"x18' Pond Heavy Pattern, 4 Heads.
48"x48"x12' Putnam Heavy, 2 Heads, M.D.
30"x30"x12' American M.D., 2 Heads.
30"x30"x10' Cinn. Heavy Pattern, 2 Hds.
20"x20"x36" Niles-Bement-Pond, Planer Shaper, M.D.

LATHES

Monarch 16" x 8' Q. C. G. with Taper Attachment and Chuck.
South Bend 16" x 6' Motorized Gap Lathe.
LeBlond 21" x 16' Hi-Dty, Taper, Chuck, M.D.
Schumaker & Boye 20" x 10' QCG**, Taper, Chuck, Belt Dr.
Putnam 26 x 12 Heavy QCG, arr. for M.D.
South Bend 13" x 6' Motorized, Pl. Chge Gear; Complete.
Seneca Falls 12" x 5' Belt Dr. Pl. Change, "Star Lathe."
1—#6 Warner & Swasey turret lathe, geared friction head, cross sliding turret, arranged Lima motor drive.*

SHAPERS AND GEAR CUTTERS

16" Queen City, M.D.
7" Rhodes Horiz. High Speed, Belt Dr.
26" Cincinnati Triple Geared Belt Dr.
#612 Fellows 36" Gear Shapers, (2)
14" Steptoe, M.D.
12" Schuchart & Schutte Gear Hobber.

MISCELLANEOUS

Lakewood High Lift Truck, platform type, 4000# capacity, less batteries.
J. C. Miller Co. Lacq. Heater with acquistat.
Heat Treating Furnaces for the tool room, all sizes.
Sleeper & Hartley #1 Wire coiling machine for making BX cable.
50 K.W. Moesta Gun Welder Transformer, portable, 25 cy. 440 volts.
Grinding Wheels for #2 centerless 4" face, 20" diameter.
Bertsch 3"x3"x3/8" angle bending roll.
Blake and Knowles 12x2x12 Simplex Type, Hydraulic Steam Pump, 2000 lbs. pressure with 8 to 125 lbs. steam, delivers 9 gallons per minute.
Niagara #98 Brake & Folder, 72 cap. 14 ga. arranged M.D.

*Motor Driven. **Quick Change Gear.

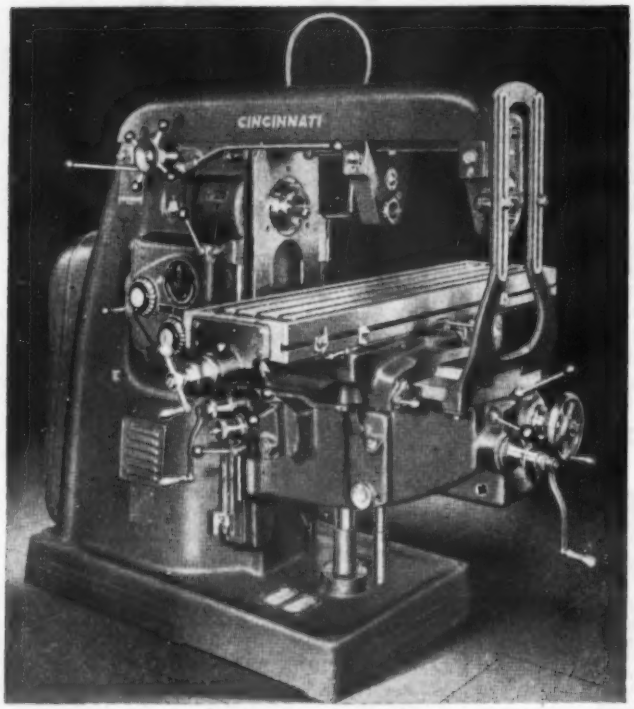
The above list, selected from our current stock, is subject to prior sale or subsequent additions. Hence we urge your prompt inquiries on any of these machine tools or others in which you are interested.

Falk

MACHINERY COMPANY

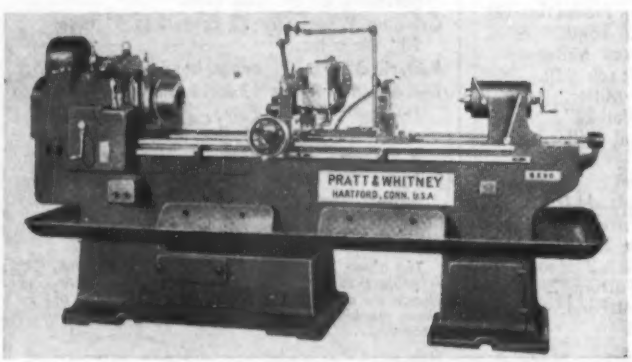
TELEPHONE
MAIN 6347 - 6348

18 WARD STREET
ROCHESTER 5, N. Y.



No. 3 CINCINNATI PLAIN (DIAL TYPE) MILLING MACHINE

No. 4 CINCINNATI PLAIN HYDROMATIC MILLER



6"x60" PRATT & WHITNEY THREAD MILLING MACHINE

MODERN M

Many purchased group of machines spe excellent condition Imm

VERTICAL MILLS

No. 3 CINCINNATI MEDIUM SPEED DIAL TYPE VERTICAL MILL.
No. 3 CINCINNATI HIGH SPEED DIAL TYPE VERTICAL MILL.
No. 4 CINCINNATI HIGH SPEED DIAL TYPE VERTICAL MILL.
No. 4 CINCINNATI HIGH POWER VERTICAL MILLING MACHINE, Single pulley drive, Motor drive.
No. 3K MILWAUKEE VERTICAL MILLING MACHINE.
No. 4H MILWAUKEE VERTICAL MILLING MACHINE.
No. 4K MILWAUKEE VERTICAL MILLING MACHINE.
No. 5 BECKER VERTICAL MILLING MACHINE, Cone drive with motor.
No. 1 BROWN & SHARPE VERTICAL MILLING MACHINE, Cone drive with motor.
No. 2 BROWN & SHARPE VERTICAL MILLING MACHINE, Cone drive with motor.
No. 5C BROWN & SHARPE VERTICAL MILLING MACHINE, Motor drive, Cone drive.
No. 2 CINCINNATI VERTICAL MILLING MACHINE, Cone drive with motor.
No. 2 CINCINNATI HIGH POWER VERTICAL MILLING MACHINE, Single pulley drive, Motor drive.
No. 3 CINCINNATI HIGH POWER VERTICAL MILLING MACHINE, Single pulley drive, Motor drive.
No. 2½B KEARNEY & TRECKER VERTICAL MILLING MACHINE, Motor driven.

PLAIN MILLS

No. 3 CINCINNATI PLAIN MILLING MACHINE, Dial feed.
No. 4 CINCINNATI HIGH SPEED DIAL TYPE PLAIN MILLING MACHINE.
No. 2 CINCINNATI HIGH POWER PLAIN MILLING MACHINE, Single pulley drive, Motor drive.
No. 3 BROWN & SHARPE PLAIN MILLING MACHINE, Cone drive with motor drive.
No. 3B HEAVY BROWN & SHARPE MILLING MACHINE, Single pulley drive, Motor drive.
No. 4 BROWN & SHARPE PLAIN MILLING MACHINE, Single pulley drive.
No. 4B HEAVY BROWN & SHARPE PLAIN MILLING MACHINE, Single pulley drive, Motor drive.
No. 2 CINCINNATI PLAIN MILLING MACHINE, Cone drive with motor drive attachment.
No. 3 CINCINNATI HIGH POWER PLAIN MILLING MACHINE, Single pulley drive, Motor drive.
No. 4 CINCINNATI HIGH POWER PLAIN MILLING MACHINE, Cone drive with motor drive attachment.
No. 4 CINCINNATI HIGH POWER PLAIN MILLING MACHINE, Single pulley drive, Motor drive.
No. 2 HENDEY NORTON PLAIN MILLING MACHINE, Cone drive with Cullman motor drive.
No. 4H LEBLOND PLAIN MILLING MACHINE, Cone drive with motor drive attachment.
No. 3B MILWAUKEE PLAIN MILLING MACHINE, Single overarm, Single pulley drive, Motor drive.
No. 2 VAN NORMAN MILLING MACHINE, Complete with sub-head, dividing head, Motor driven, Single pulley drive.

UNIVERSAL MILLS

No. 3 CINCINNATI HIGH POWER UNIVERSAL MILLING MACHINE, Single pulley drive, Motor drive.
No. 3 BROWN & SHARPE UNIVERSAL MILLING MACHINE, Cone drive, with L W Head.
No. 3 KEMPSMITH UNIVERSAL MILLING MACHINE, Cone drive, Motor drive attachment.

ADAMS MACHINERY CO 14 SOU

MDNA MEMBER

OR • GEORGE M. BRN

MACHINE TOOLS

ed new after 1941 • This fine especially priced for quick disposal • In Immediate delivery • No priority necessary.

PRODUCTION MILLS

No. 4—36" CINCINNATI PLAIN HYDROMATIC MILLER.
No. 5—48" CINCINNATI PLAIN HYDROMATIC MILLER.

LATHES

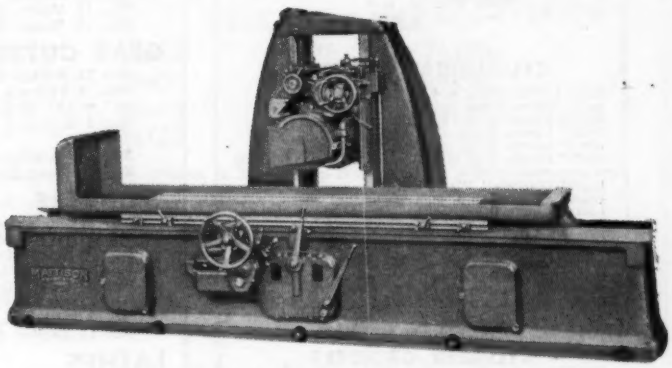
14x30 HENDEY ENGINE LATHE, Cone drive with Hendey Motor Drive Attachment.

16x72 HENDEY ENGINE LATHE, 12 Speed Geared head.

17x10 SIDNEY GEARED HEAD ENGINE LATHE, 8 Speed, Motor driven.

17x52 LEBLOND RAPID PRODUCTION ENGINE LATHE.

18x8 HENDEY ENGINE LATHE, Cone drive, Motor drive attachment. Complete with collets and draw bar.



14"x20"x60" MATTISON HYDRAULIC SURFACE GRINDER

GRINDERS

14x20x60 MATTISON HYDRAULIC SURFACE GRINDER, Motor driven.

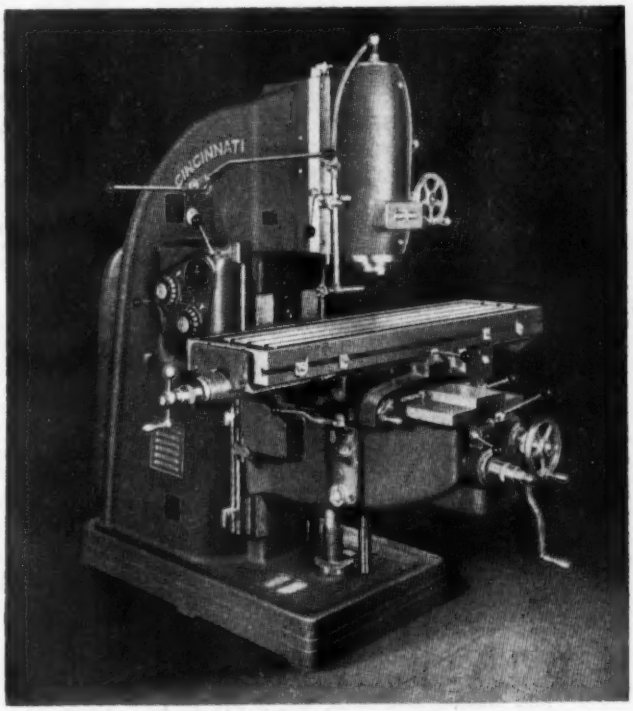
HILL VERTICAL SURFACE GRINDER, Motor in head.

14x72 NORTON GRINDER, Motor driven with three motors.

No. 2A BLACK DIAMOND DRILL GRINDER.

No. 14 PRATT & WHITNEY VERTICAL BALL BEARING SURFACE GRINDER, Motor driven.

No. 3 GALLMEYER & LIVINGSTON UNIVERSAL TOOL & CUTTER GRINDER, With equipment.



No. 3 CINCINNATI VERTICAL HIGH SPEED DIAL TYPE MILLING MACHINE

THREAD MILLS

6x80 PRATT & WHITNEY THREAD MILLING MACHINE, Motor driven.

6x60 PRATT & WHITNEY THREAD MILLING MACHINE.

MISCELLANEOUS

No. 4 COLBURN DRILL, 12" extra height in column.

No. 4A WARNER & SWASEY TURRET LATHE, Motor drive, no cross slide.

2½" CLEVELAND HORIZONTAL BORING MILL, Extended base, 3' longer than standard, Single pulley drive with motor and one bar.

EKLIND VERTICAL MILLING HEAD.

10" NILES SLOTTER, Cone drive with motor.

COMPLETE QUOTATIONS AND ACTUAL PHOTOGRAPHS FURNISHED ON REQUEST

WRITE ***WIRE*** ***PHONE***

14 SOUTH CLINTON STREET, CHICAGO 6

RNSTEIN and CO. **12 SOUTH CLINTON STREET, CHICAGO 6**

EASTERN OFFERS FROM STOCK

NO PRIORITY NEEDED

GEAR CUTTERS & HOBBERS

No. 3 Barber-Colman, m.d.
No. 12 Barber-Colman Double Overarm, m.d.
No. 3-26" Cincinnati Spur Gear Cutters
Cincinnati Gear Burnisher, m.d.
No. 3-26", 3-36", 3 Heavy, No. 4-36", 4-48", 6-60", 6-72" Brown & Sharpe Automatic Spur Gear Cutters
48" Cleveland Gear Hobber
No. 72 Fellows H.S. Gear Sharper, m.d.
Gleason Spiral Bevel Gear Roughter
Gear Testing Machine, belt drive
11" Gleason Straight Bevel Gear Generator, m.d.
18" Gleason Straight Bevel Gear Generator, belt
Cross Gear Tooth Rounder, belt
Cross Gear Tooth Rounder, m.d.
30" Brainerd Gear Cutter, belt

CYLINDRICAL GRINDERS

6x18" Landis plain, m.d.
6x32" Norton Plain, m.d.
10x48" Brown & Sharpe Plain, m.d.
10x52" Landis Plain, m.d.
10x72" Landis Plain, m.d.
10x96" Landis Type C Plain Hydraulic, m.d., latest type
12x36" Cincinnati Plain, belt
12x36" Modern Plain, m.d.
12x42" Landis Plain, belt
12x48" Cincinnati Plain, 3 motor drive
12x48" Modern Plain, belt
20x120" Landis Plain, m.d., with 36" gap
26x96" Landis Plain, m.d.
16x72" Landis Plain, m.d.
16x40" Landis Universal, m.d.
16x72" Landis Universal, belt

CYLINDER GRINDERS

No. 50 Heald, m.d., hydraulic
No. 55, 60, 65 Heald

VALVE SEAT GRINDER

Cincinnati Valve Seat Grinder, m.d., cap. ⅜" valve stems, centerless type

PRESSES

851 Ferracute D.C., 2" stroke, 28" between uprights
No. 268¼B Toledo D.C. Toggle Drawing, 84¾" between uprights, 15" stroke of blankholder, weight 175,000 lbs.
No. 496D Toledo D.C. Toggle Drawing, m.d., stroke of blankholder 11½", 90" between housings, weight 160,000 lbs.
B45 Metalwood Hydro-Pneumatic Press, 10 ton cap.
B33 Metalwood Hydro-Pneumatic Press, 15 ton cap.
No. 0 Springfield Bench Type Straightening Press

RIVETERS

John Adt, 6" throat, ⅛" cap., belt
¼" Shuster, belt
Pedrick & Ayer Pneumatic, 6" throat
Chicago Pneumatic size 10x25x97, 24" throat
Hanna Bench Type Air, 8" throat
No. 3A Heavy Duty High Speed Hammer

SAWS

6" Avey Millband Cut-off Machine, s.p.d.
6x6" Kiemm Tilting Metal Cutting Band Saw
No. 6 Cochran-Bly Cold Saw, m.d.
No. 5 Cochran-Bly Cold Saw
No. 3 Nutter & Barnes Cold Saw
No. 8 Nutter & Barnes Cold Saw, md.
No. 15 Lea-Simplex Cold Saw
Knowlton Cold Saw, 24" blade
5" Newton Cold Saw, 20" blade
No. 11½ Higley Cold Saw, belt
No. 138 Espen-Lucas Cold Saw, m.d. 30" blade

SHAPERS

22" Niles Traveling Head Shaper, belt, 2 work tables

More than 1,000 machines in stock. Let us quote.

The
EASTERN
MACHINERY CO
1004 TENNESSEE AVE
CINCINNATI 29, OHIO

. . . IN STOCK

AUTOMATICS

⅞" Cleveland Model M, four spindle
9/16" Davenport
1¾" Gridley Model G, four spindle
3¼" Cleveland Model A, single spindle

BROACHES

No. 4 LaPointe, m.d.
15 Ton Hercules, m.d.

DRILLS

30" Hamilton Upright, p.f.
3' Prentice Radial, s.p.d.
4' Dresses Radial, s.p.d.
No. 310 Baker, single spindle
24" Barnes Camelback, single spindle
Avey Sensitive, four spindle
Leland-Gifford, Sensitive, three spindle
No. 11 Natco Multiple Spindle
No. 14 Natco Multiple Spindle

GEAR CUTTERS

No. 12 Barber-Colman
No. 6 Fellows Gear Shaper, m.d.
30" x 10" Maag Gear Shaper, m.d.
No. 3 Brown & Sharpe Automatic Gear Cutter
30" Consolidated Gear Tooth Rounder
96" Gleason Spur & Bevel Gear Planer

GRINDERS

No. 2 Cincinnati Centerless
No. 72A3 Heald Gagematic
No. 75 Heald Internal
No. 70 Heald Internal
No. 4 Landis Universal
30" Diamond Face, 84" table travel
No. 2 Wilmarth & Morman Surface
No. 12 Brown & Sharpe Cutter

LATHES

14" x 6' Lodge & Shipley, g.h.
14" x 10' Pratt & Whitney, c.d.
16" x 6' Hendey, c.d., q.c.
18" x 6' Lodge & Shipley, g.h.
20" x 8' Lodge & Shipley, c.d.
22" x 10' Lodge & Davis, c.d.
29" x 14' Schumaker, Boye & Emmes, c.d.
8" x 60" Fitchburg Lo-Swing, g.h.

TURRET LATHES

24" Bullard New Era V.T.L., m.d.
42" Bullard Vertical Boring Mill
No. 4A Warner & Swasey, 7¾" Hole, Timken
No. 1B Foster, m.d.
2¼" x 24" Jones & Lamson, M.D. (serial over 40,000)
No. 4 Warner & Swasey, c.d.

MILLS

No. 20 Van Norman Duplex, m.d.
No. 1M Cincinnati Universal, m.d.
No. 3 LeBlonde Plain, c.d.
No. 3 Brown & Sharpe Vertical, m.d.
Model C Becker Vertical, m.d.
Model B Gooley & Edlund, c.d.
No. 12 Brown & Sharpe, c.d.
144" Betts Vertical Boring Mill, 2 head, m.d.
4" Fosdick Horizontal Boring Mill, m.d.
Pratt & Whitney Spline Mill

MISCELLANEOUS

16" Betts Slotter
Wicaco Oil Groover
No. 3 Eclipse H.S. Furnace

PLANERS & SHAPERS

24" x 24" x 8' American Planer, one head
30" x 30" x 12' Ohio Planer, two heads
48" x 48" x 12' Cincinnati Planer, 4 heads
96" x 96" x 25' Detrick & Harvey Open-side Planer, 4 heads
24" Gould & Eberhardt Shaper, s.p.d.

Complete Facilities for REBUILDING and MOTORIZING Your Old Machine Tools.

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INDIANAPOLIS 6, INDIANA
Eastern Branch:
44 WHITEHALL STREET, NEW YORK 4, N. Y.

Ready For Shipment

AUTOMATICS:

B & S #00
Cleveland 1½" Model M, 4 Sp.
Gridley 5"—Single Spindle M.D.
New Britain #23, 33 Chuckers
Potter & Johnston & #6C Chuckers

BORING MILLS:

Cleveland 2½" Bar Horiz.
Universal 3½" Bar Horiz.
Bertram 42" Vertical

BROACH:

Lapointe #4W Hydraulic

DRILLS:

Niles 7' Radial
Cincinnati-Bickford 5', 6' Radials
Pratt & Whitney Gun Barrel Drills & Rifflers

GEAR CUTTERS:

Brown & Sharpe #3—26"
Fellows #64
Fellows Gear Burnisher
Gleason 6" Generator

GRINDERS:

Norton 6x32, 10x24, 18x96
Baxter D. Whitney #23 Cylinder Grinder. Like New
Brown & Sharpe #11 Plain
Brown & Sharpe #3 Univ.
Bath 10"x25" Univ.
Cincinnati 12"x36" Univ.
Cincinnati #1½ Tool & Cutter
Pfauter Hob Grinder
Abrasive #33 Vertical Surface
Diamond #1 Surface
Bryant #3B, 6, 12, 18 Internal
P & W 14" B.B. Vert. Surface
Farrel Roll Grinder

LATHES:

Monarch & LeBlond 14"x6'
Sidney 17"x8'
Lodge & Shipley 20"x8' Selective G.H.
Johnson 30"x24'
Wicken 32"x15'
McCabe 33"x55"x10½'—Two in One
Sundstrand M.D. Stub
Lo-Swing 4"x60", 3½"x108"
J & L 2¼x24, 3x36 Flat Turret

MILLERS:

Van Norman #2 Duplex
Cincinnati #3, 4 Plain SPD
Milwaukee #1½ Vertical
Becker #4B Vertical
Cincinnati #4 Vertical SPD
B&S #3 Vertical SPD
P & W 6x48 Thread Miller
Hanson-Whitney Thread Miller
Waltham Bench Thread Miller
Rowbottom Cam Miller
P & W 5" Automatic
Pratt & Whitney 2" Spline Duplex
Pratt & Whitney 4½"x12", 6"x48", 6"x80" Thread Millers
Cincinnati 12" B.G. Mfg. Becker #7H Lincoln

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Chamfering Machine—Pratt & Whitney
Chucking Machines—Potter & Johnston #6-C
Hammers—Helve
Hammer—Beadry #6—150 Lb. Power
Hammer—Bliss 300 Lb. Drop
Honing Machine—Garlin Model MCV New
Keyseater—Mitts & Merrill #3
Shear—Marshalltown #88 Rotary Bevel, M.D.
Tapper—Threadnut #2
Upsetter—Acme 2" Steel

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Whitcomb 22"x22"x5'—24"x24"x6'
American 26"x26"x8'
Cincinnati 30"x30"x10'
Cincinnati 36"x36"x20'
Gray 36"x36"x10' 2 Head Planer
Whitcomb 30"x30"x8'
Gray 42"x42"x12' 4 Head
Cincinnati 48"x48"x20' — 3 Head
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9" Pratt & Whitney Gear Grinder, M.D.
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Cimatool Gear Chamfering Mach., M.D.
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36"x36"x 9' Woodward & Powell Planer, Rev. M.D.
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No. 1—12" and 1—18" Cincinnati Plain Automatic millers, latest type (19)
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No. 2-3-4 Plain & Vertical Cincinnati High Power Millers, M.D.
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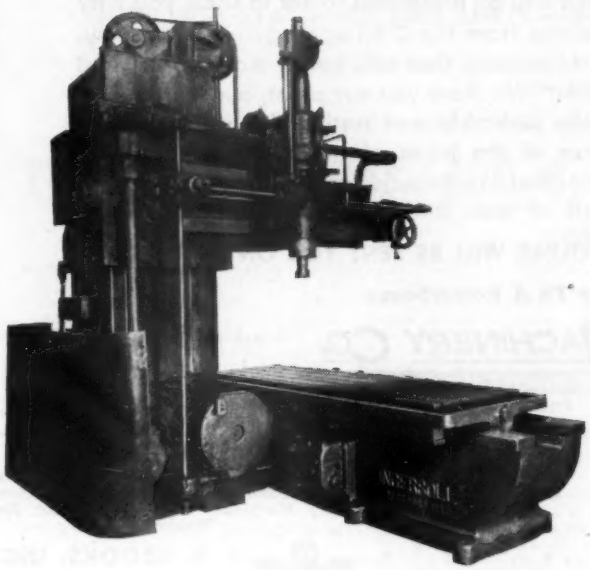

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PRESSES (Inclinable) 3—#18, 3—#19, 18—#20, 9—#21, 3—#21B, 6—#23 BLISS : 3—#4½, 1—#6, 1—#5A TOLEDO : 2—#01, 3—#3, 1—#4 V & O : 1—#A3½, 1—#A4 NIAGARA. (Straight Side) 1—#75½ BLISS : 1—#5 MANVILLE. (Double Crank) 1—#3, 1—#102, 1—#2C, 1—#2D BLISS : (Double Crank—Tie Rod) 1—#3A, 1—#6½-48, 1—#6, 1—#5 BLISS : 1—#94D, 1—#90C, TOLEDO. (Horn & Wiring) 1—#16 NIAGARA : 2—#39, 2—#16, 1—#4 BLISS #7N Bliss Punch Press . . . also Back Wheel, Sprue Cutter and Bench Presses.

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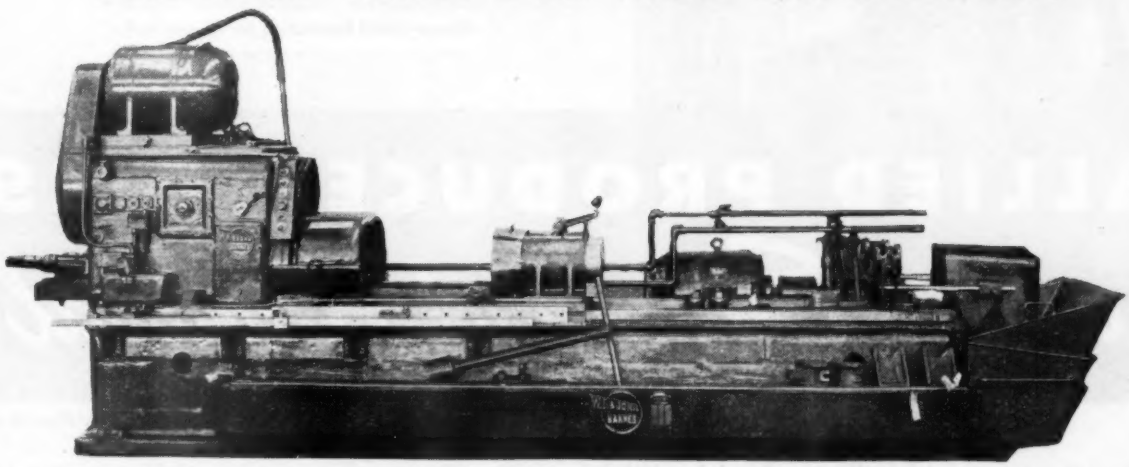

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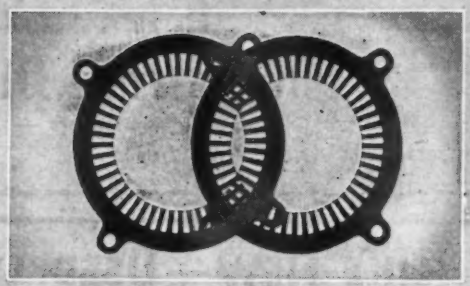

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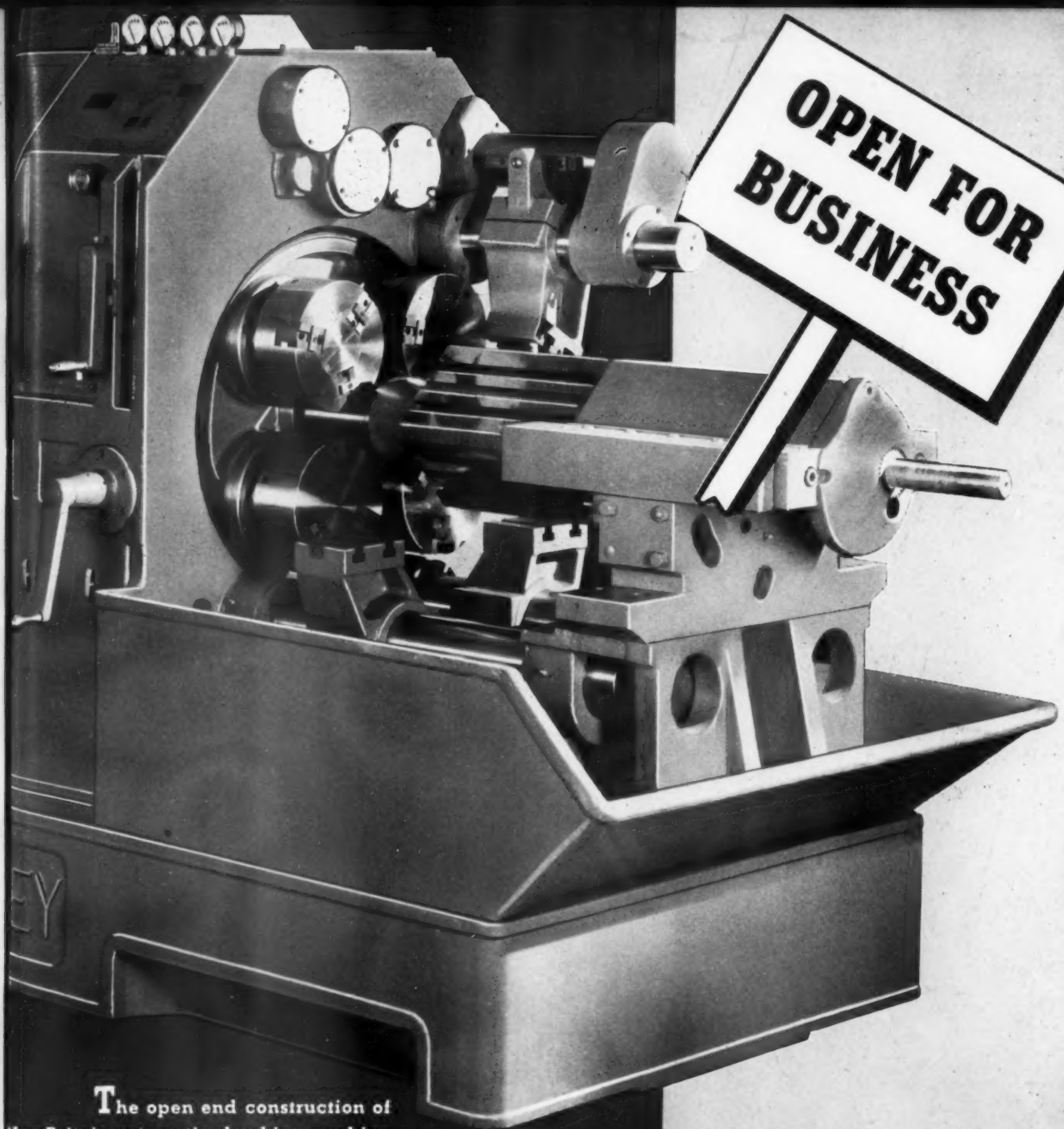

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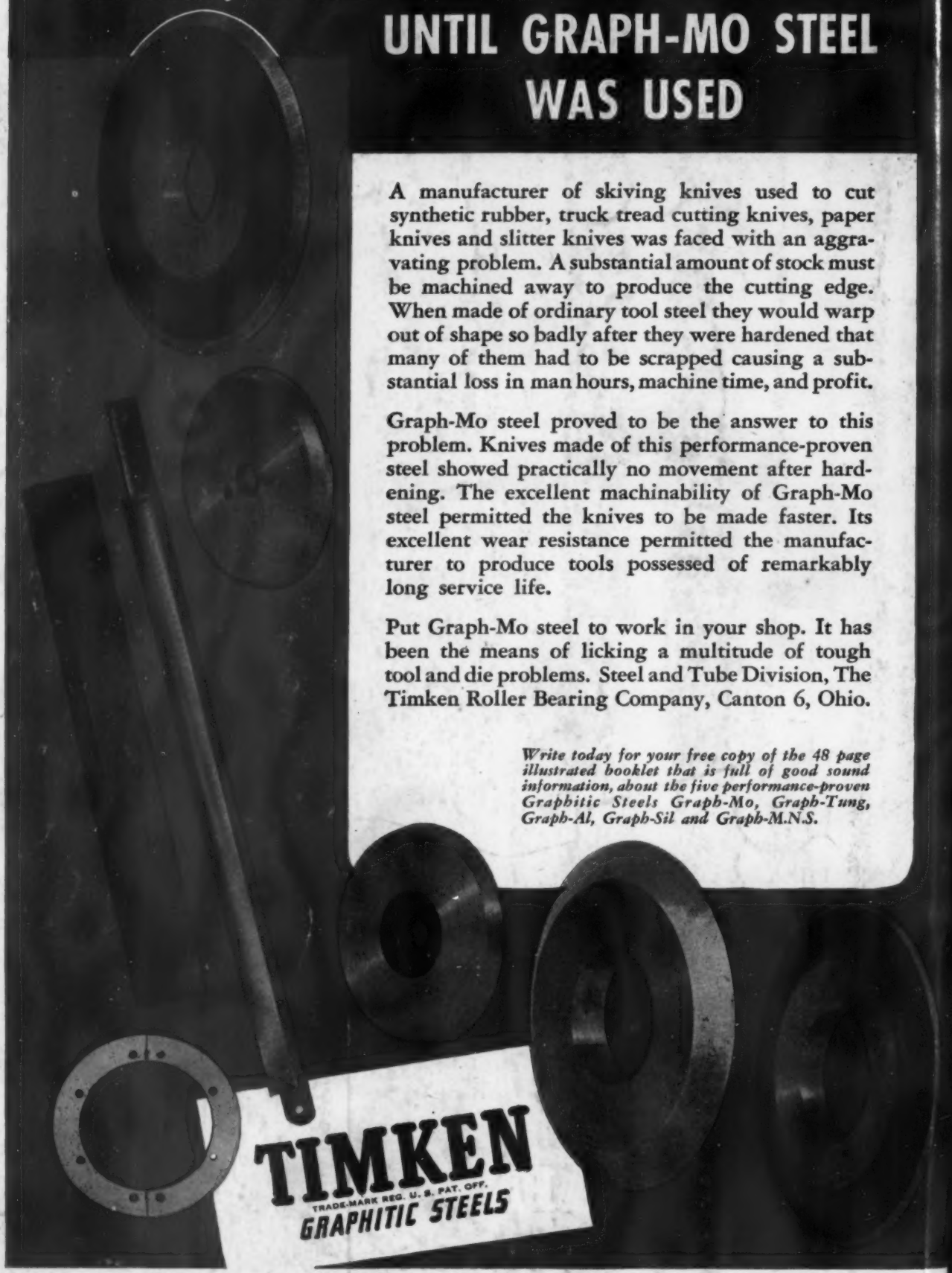

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